McGraw-Hill
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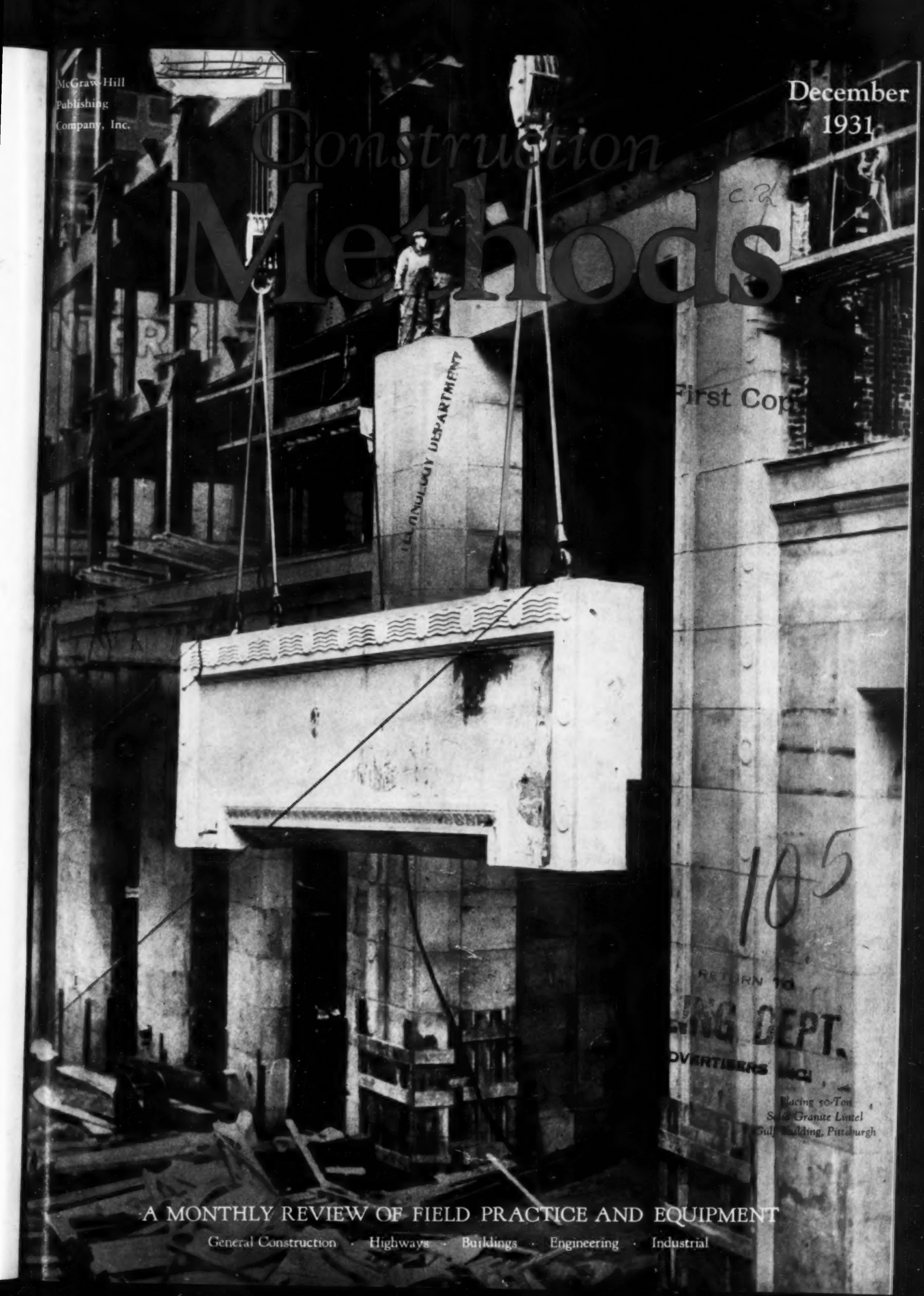
December
1931

Construction Methods



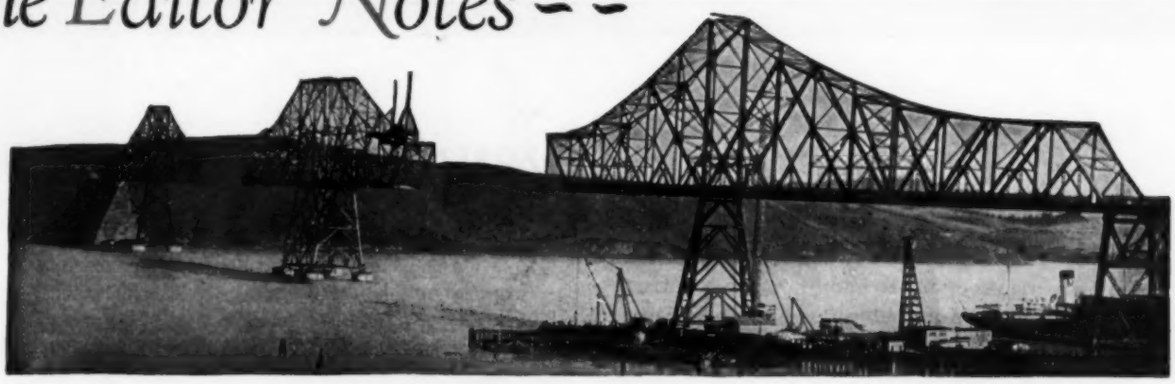
Placing 50-Ton Solid Granite Lintel Gulf Building, Pittsburgh

A MONTHLY REVIEW OF FIELD PRACTICE AND EQUIPMENT

General Construction · Highways · Buildings · Engineering · Industrial

CONSTRUCTION METHODS, December, 1931. Vol. 13, No. 12. Published monthly. McGraw-Hill Publishing Company, Inc., 330 West 42d Street, New York, N. Y. $1 per year. Foreign Postage, $1.00. Canada (including Canadian duty), $1.50. 10 cents per copy. Entered as second-class matter, October, 1926 issue. Vol. 8, No. 10, at the Post Office at New York, N. Y., under the Act of March 3, 1879. Printed in U. S. A.

The Editor Notes - -



For More Effective Editorial Service

IN RECOGNITION of effective work as editorial director of the McGraw-Hill publications since 1929, Dr. H. C. Parmelee last month was elected a vice-president of the company. To his new responsibilities as an executive officer of the organization, he brings an experience which includes service with the Union Pacific Railroad, the American Smelting and Refining Co., the presidency of the Colorado School of Mines and the editorship of *Chemical and Metallurgical Engineering*. In carrying on his work of guiding general editorial policies Dr. Parmelee's objective will be the still closer coordination of the resources of thirty engineering, industrial and business publications to the end that the interests of their readers may be served in the future even more effectively than they have been in the past.

▼

A Nation-Wide Call for Unemployment Relief

Unemployment relief on a nation-wide scale is the most urgent human problem confronting the American people today. Regardless of the causes of the depression or of the remedies that will ultimately bring about recovery, we are faced with the fact that millions of people must be supplied with the necessities of life this winter by those who have suffered less through the unequal distribution of work and income. The method of relief that has been sponsored by those in authority depends for its success on sharing with the unemployed the income of those who still have money and jobs.

The principle extends not only to individuals but also to every branch of business and industry. Under the guidance of the President's Organization on Unemployment Relief, with Walter S. Gifford, director, and Owen D. Young, chairman of the committee on mobilization of relief measures, funds are now being gathered in every city, town and village through established welfare and relief agencies. In the construction industry this winter general conditions throughout the country will aggravate the usual hardships caused by seasonal unemployment. By contributing generously to the relief of the unemployed in their own localities construction men who have jobs will be doing the best possible service to themselves by laying the foundation for better days that are sure to come.

CONSTRUCTION METHODS

A monthly review of modern construction practice and equipment

ROBERT K. TOMLIN, *Editor*

Editorial Staff

VINCENT B. SMITH NELLE FITZGERALD

J. I. BALLARD (San Francisco)

WILLARD CHEVALIER, *Publishing Director*

McGraw-Hill Publishing Company, Inc.

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Paving With Transit-Mixed Concrete

One of the features of the annual Road Builders' Number of *Construction Methods*, to appear next month, will be a detailed description, with illustrations, of the paving of a 40-ft. highway with transit-mixed concrete. From a fleet of truck-mixers the batches were delivered to the subgrade by a portable belt conveyor. Both in method and in equipment the job is noteworthy as a radical departure from standard concrete paving practice.

Watch for the story in next month's issue.

Sound Advice on Bidding Practice

MISMANAGEMENT of construction work, with attendant financial losses, generally starts with lack of intelligence in the preparation of a bid. On this general topic of bidding practice, Richard Hopkins, road-building contractor of Albany, N. Y., gave some sound advice to the highway division of the American Society of Civil Engineers. He said, in part:

"As a general rule, a man who obtains more than 20 per cent of the work on which he bids is not a good bidder. He is bidding below the market. Good bidding is more often found among those who are awarded contracts for fewer than 10 per cent of their bids. It is much better to let machinery depreciate and parts of an organization stay idle, than it is to lose cash from a bank account. From two to six months before a job is planned to be finished the contractor should be looking over prospective work and putting in occasional bids on desirable jobs. There is no more pitiful figure in the construction world than the man who has a smoothly running and efficient organization on a particular job and waits until a week or two before it is finished to start bidding on new work. The result is likely to be bad from three angles: The new work may not be the right kind; it may not be obtained in time; and the price may be much too low."

▼

Hangars as Auditoriums

Selection of an airplane hangar at Detroit for the meeting of the American Road Builders' Association, Jan. 11-15 emphasizes this new asset that has come to many cities. The existence of large structures for the housing of airplanes provides a place for large assemblages and for exhibits of equipment that will be of great advantage to many communities.

To Increase Unemployment

HERE and there a few legislators are advocating reversion to hand-labor in construction as a measure of unemployment relief. Some of this agitation may be charged to narrow vision and loose thinking; more of it is barefaced playing to the local political gallery by men who should know better.

Such mistaken and reckless proposals are a menace to early recovery from our present trouble, for every law directed to that end might properly be entitled, "An Act to Increase Unemployment in the United States."

In appraising such suggestions, however appealing and plausible they may seem, the sensible citizen will bear in mind these elementary facts:

1 The adequate production and conservation of wealth is more essential than ever in time of stress and is possible only if we maintain the productivity of those who are employed. This is not a time to renounce the progress of centuries and to revert to primitive and wasteful methods; it is a time for us to conserve our resources, not to dissipate them.

2 Funds to finance additional employment can come only from the earnings of the people, either as general taxes upon all or as contributions from the surplus resources of some. If we increase wastefully the cost of public works we but dry up both these resources upon which we must rely for the creation of additional work. It is childish to forget that the high cost of primitive methods will cut down the amount of work that can be undertaken much more rapidly than additional workers can be absorbed.

3 Moreover, interference with normal operations is not necessary. Much "extra" labor can be applied effectively by every community to work that would not normally be undertaken and that does not lend itself to mechanical operation. Such "made work" may be financed from relief funds without wasteful extravagance and without interference with normal projects. It provides *added* employment without detriment to normal operations, the efficient prosecution of which makes possible the surplus required for emergency relief.

4 To relieve local unemployment by such methods simply starts a train of further unemployment that extends back into the stores of distributors, the factories of manufacturers and the works of raw-materials producers. The security and progress of our country lie in its economic unity; we cannot solve local problems by ignoring their national effects. We gain nothing by creating unemployment and destroying capital at many points to effect momentary relief at a few.

TO the thoughtful citizen and public official it is evident that such a policy would launch us upon a vicious spiral, of which every revolution would but breed further unemployment and drag us down into greater distress. Such proposals are especially unfortunate when they are levelled against the construction industry, of all our basic industries perhaps the most far reaching and potent in its influence for good or evil upon the general recovery of business.

Willard Chevalier

Publishing Director.

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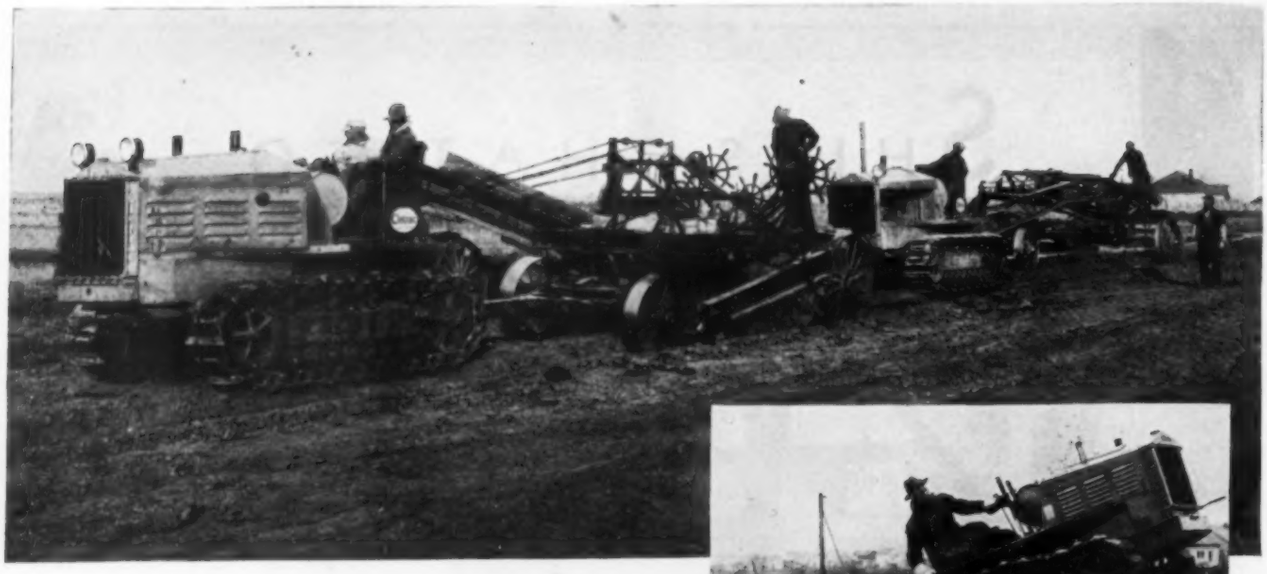
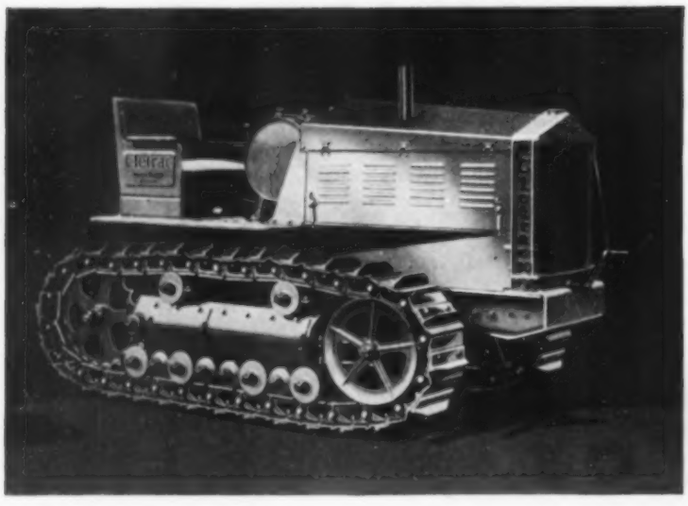


BIG JOBS *or* LITTLE

HERE ARE 5 TRACTOR SIZES —FIFTEEN TO EIGHTY H. P.— *to meet* EVERY POWER NEED

THERE are no jobs too big or too little for Cletrac Crawler Tractors. They are built in a complete line-up of sizes to match the requirements of your entire range of work. Whether it's a power-eating job with big elevating graders or the comparatively small operation of a half yard fresno, there's a Cletrac size to fit—and save you money on the job.



Cletrac Crawlers are real money-savers and money-makers on any job they tackle. They deliver their full rated power at the draw-bar and still have a 25% margin in reserve for over-loads. They travel fast and go anywhere on their broad, sure-gripping tracks. They maneuver nimbly and can be swung around with only finger pressure at the controls.

You will like Cletrac's features of patented planetary gear steering, the sturdy construction and simplified engineering, the complete dust-proofing and continuous oiling that saves time and repair costs.

Get the complete story of these efficient tractors and how they can serve you better and more economically. The Cletrac distributor near you will gladly demonstrate—or write direct for full information.

THE CLEVELAND TRACTOR COMPANY
19323 Euclid Avenue Cleveland, Ohio

CLETRAC
CRAWLER TRACTORS

THIS IS PAG 5

STEERS with the ease of a truck!

HERE is the tread trail. It illustrates that both crawlers are driven under full power even while turning. This means greater turning force on the curves — tractive power when you need it most — power that gets you over the bad places.

There is no sadder sight than the feeble efforts of a "lame duck" shovel trying to pivot a corner on that dead anchor of a crawler. Sad — and costly!

The Northwest steers with the ease of a truck — full power on both crawlers even while turning — positive traction at all times.

Steering is accomplished *from the cab with the cab in any position.* There are no gadgets to lower and no need to swing the cab or worry about fouling the boom.

Get up to date on mobility — find out why Northwest owners say the Northwest is the most mobile shovel on the market. You need its advantages.

NORTHWEST ENGINEERING COMPANY

The world's largest exclusive builders of gasoline, oil burning and electric powered shovels, cranes and draglines

1728 Steger Bldg. 28 E. Jackson Blvd. Chicago, Ill., U. S. A.

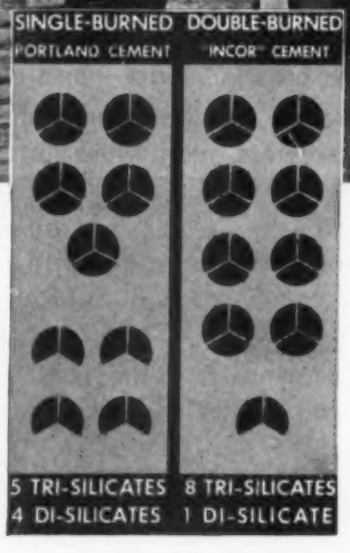
HANDLE 25% HARDER DIGGING

CM13Gray

NORTHWEST

SHOVELS • CRANES • DRAGLINES • PULLSHOVELS • SKIMMER SCOOPS

"You'll have to get



"YOU CAN'T BLOCK TRAFFIC THIS WAY." A re-enactment of the Albany scene described on the opposite page, in which a driller, tackling his first 'Incor' core, had his calculations upset and tied up Clinton Avenue traffic for half an hour.

WHY 'INCOR' IS TOUGH. (Left) The diagram serves to illustrate the difference in chemical constitution between ordinary Portland Cement and 'Incor' Portland Cement. The complete circles symbolize molecules of *tri*-calcium silicate which are active and combine easily and thoroughly with water. The incomplete circles symbolize molecules of *di*-calcium silicate which are sluggish and combine slowly. This difference in refinement, which insures extremely high *early*-and *ultimate* strength, is achieved by double burning.

the rest of those after the street cars *stop*"

IT all began as an experiment, and ended—or nearly ended—with a summons . . .

Back in 1927 the United Traction Company of Albany, New York, was laying sections of concrete pavement within their track areas.

Their engineers had heard of 'Incor,' had investigated it, and decided to try it on one of their special jobs—a cross-over on Clinton Avenue—where concrete had to be laid without interrupting traffic.

The 'Incor' concrete was duly laid. Adjoining it, as a comparative test, a section of ordinary Portland cement was laid, to which had been added, to promote rapid hardening, 8 pounds per bag of a commercial "accelerator."

In 24 hours the 'Incor' pavement was opened to traffic. Despite the accelerator, the adjoining section of concrete was held for another full day.

4 Years Pass

As time went by the fine condition of the 'Incor' pavement attracted notice, and the question of strength came up. It was decided to drill cores from the pavement and determine exactly what the ultimate strength might be.

On June 1, 1931, a driller called on the Traction Superintendent for permission.

"You want to drill cores, eh, on Clinton at the Robin Street Cross-over. How big?"

"Four inch."

"How long will they take you?"

"About 6½ minutes apiece."

"All right. Go out at 10 and get them between cars."

The driller manned his truck, drove to the crossing, waited till Belt Line No. 3 passed, and immediately began drilling 'INCOR' CORE No. 1. He felt easy. He had 7 minutes before the next car was due.

He didn't feel easy long.

Fourteen minutes passed, two street cars were tied up, a motorman was glaring at him—and he wasn't half-way through the first core.

He added water to the drill, increased the pressure, and cursed the concrete.

Twenty minutes later he was still at it. Five street cars were lined up, traffic was blocked, three motormen were trying to help him and a passenger had gone for a policeman—who soon appeared.

"What are you doing?"

"Drilling cores."

"Where's your permit?"

"Here."

7200 POUNDS PER SQUARE INCH. Compression machine and broken specimen. The five 4-year old 'Incor' cores drilled from the Robin Street cross-over in Albany, New York, developed an average compressive strength of 7200 pounds per square inch.

"How long will you take?"

"I'm just about done with this one."

"How many more do you want?"

"Four."

"*Four!* You can't block traffic this way. You'll have to get the rest of those after midnight, when the street cars stop."

Which is exactly what he did—working from 2 A. M. till dawn.

The toughness of this concrete was something new in a driller's experience—a fact amply borne out in the ultimate strength tests next day.

These five 'Incor'* cores, 4 years old, developed an average ultimate strength of 7200 pounds per square inch.

Cores drilled from the adjoining ordinary Portland cement special-mix concrete pavement, at the same age, developed a strength of 4343 pounds per square inch—a good strength—but 2800 pounds per square inch less than that of the 'Incor' concrete.

The extremely high *early*-and-*ultimate* strengths of 'Incor' cement are understandable when it is remembered that they are both achieved, not through the use of an admixture or an increased proportion of cement, but by means of the double-burning process which assures that every particle of the entire lot is of the same high quality.

*Reg. U. S. Pat. Off.

'INCOR' 24-*Hour Cement*

MANUFACTURED BY THE "DOUBLE BURNING" PROCESS

'INCOR' Cement is made by the producers of Lone Star Cement, under basic patents owned by International Cement Corporation, New York City

The Ransome 126-S—largest building mixer ever made—owned by the Arundel-Brooks Concrete Corporation of Baltimore, Md.

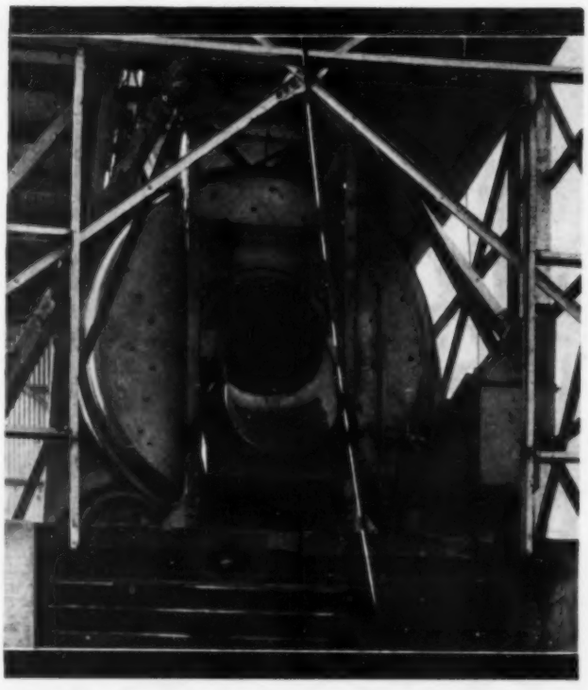
and Now! the Largest CONCRETE MIXER in the World— the Ransome 126-S

The year 1931 has seen the completion of the Empire State Building, 1250 feet high, the *tallest* building in the world.

Also it has seen the opening of the George Washington Bridge with a span of 3500 feet across the Hudson—the *largest* span in the world.

Ransome Mixers played a part in the accomplishment of these and many other outstanding engineering feats. It is also significant that Ransome—who made America's *first* mixer—should in this year of great engineering achievements make the *largest* mixer of its type in the world.

Bul. 122 will tell you more about Ransome "Big" Mixers.



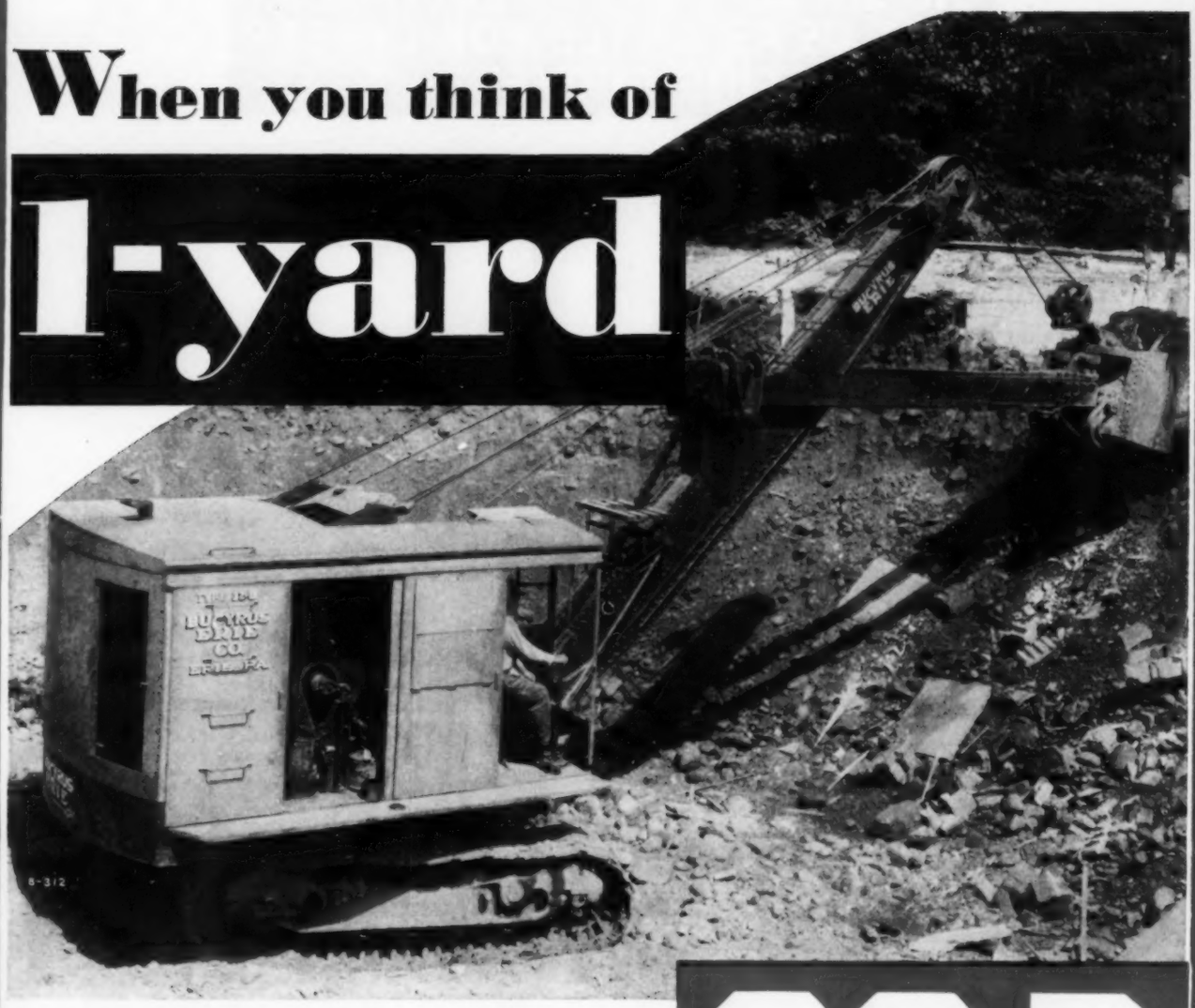
Ransome Concrete Machinery Company

1850—Service for 81 Years—1931

Dunellen **New Jersey**

When you think of

1-yard



think of 32-B

The *32-B* with any power, has effortless, positive control. Clutches and brakes are oversize. Hoist clutches are power set. All operating levers toggle in. Double-operating chocking brakes are applied from operator's position. Swing brake saves clutches when working on grades.

The *32-B* steers from the operator's position. Propelling brakes also controlled from cab. A friction brake locks the swing during propelling.

The *32-B* as a dragline combines low ground pressure and long reach. Special extra long and wide-tread mounting for dragline work in soft ground.

The 32-B is Bucyrus-Erie's 1-yard convertible shovel, dragline, clamshell, or lifting crane.

The 32-B is a hard-digging, fast operating *straight gas* machine.

Or a powerful, modern *Diesel* machine, if you prefer. Or an *electric*, if that is the power you need.

32-B brings surer profits to *any* 1-yard job.

Send for the 32-B's story.

A-383

BUCYRUS ERIE

BUCYRUS-ERIE COMPANY, South Milwaukee, Wisconsin

Representatives throughout the U. S. A. *Branch Offices:* Boston, New York, Philadelphia, Atlanta, Birmingham, Pittsburgh, Buffalo, Detroit, Chicago, St. Louis, Kansas City, Mo., Dallas, San Francisco. Offices and distributors throughout the world.

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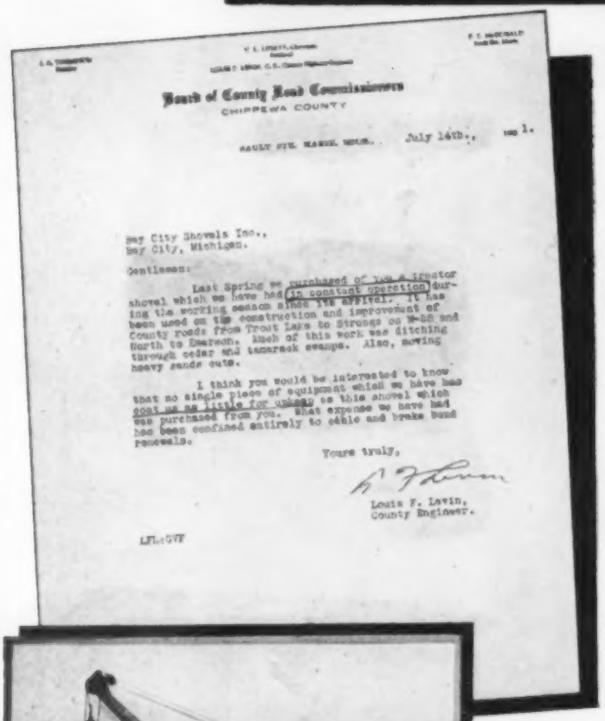
Dies Elect

"NO SINGLE PIECE OF EQUIPMENT COST US AS LITTLE FOR UPKEEP AS THIS SHOVEL".....



Board of County Road Commissioners
CHIPPEWA COUNTY

SAULT STE. MARIE, MICH. July 14th, 1931

Bay City Shovels Inc.,
Bay City, Michigan.

Gentlemen:

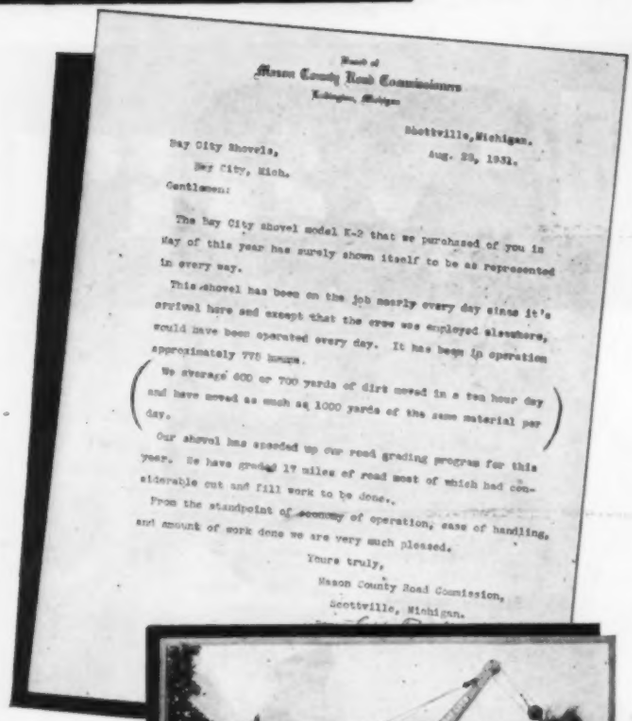
Last Spring we purchased of you a tractor shovel which we have had in constant operation during the working season since its arrival. It has been used on the construction and improvement of County roads from Trout Lake to Strongs on M-48 and North to Emerson. Much of this work was ditching through cedar and tamarack swamps. Also, moving heavy sands cuts.

I think you would be interested to know that no single piece of equipment which we have has cost us as little for upkeep as this shovel which was purchased from you. What expense we have had has been confined entirely to cable and brake band renewals.

Yours truly,

Louis F. Lavin,
County Engineer.

LFL:GVF



Board of
Mason County Road Commissioners
Ludington, Michigan

Scottville, Michigan.
Aug. 28, 1931.

Bay City Shovels,
Bay City, Mich.

Gentlemen:

The Bay City shovel model K-2 that we purchased of you in May of this year has surely shown itself to be as represented in every way.

This shovel has been on the job nearly every day since it's arrival here and except that the crew was employed elsewhere, would have been operated every day. It has been in operation approximately 775 hours.

We average 600 or 700 yards of dirt moved in a ten hour day and have moved as much as 1000 yards of the same material per day.

Our shovel has speeded up our road grading program for this year. We have graded 17 miles of road most of which had considerable cut and fill work to be done.

From the standpoint of economy of operation, ease of handling, and amount of work done we are very much pleased.

Yours truly,
Mason County Road Commission,
Scottville, Michigan.

Moved up to 1000 Yds. of dirt ! a day !

Road Commissioners, County and State Engineers, Contractors and others are unanimous in their praise of BAY CITY equipment. Read these letters—typical of comments from many others who have found—constant operation—ease of handling—low upkeep—economy of operation—and low cost yardage, reasons to add more BAY CITIES to their fleet.

***BAY CITY Shovels are made in six sizes and models,* ranging from ⅜ to full yard capacity, all equipped with powerful chain crowd. All models are convertible—use them as crane, dragline, skimmer or backfiller. BAY CITY Shovels have established a reputation of being—**

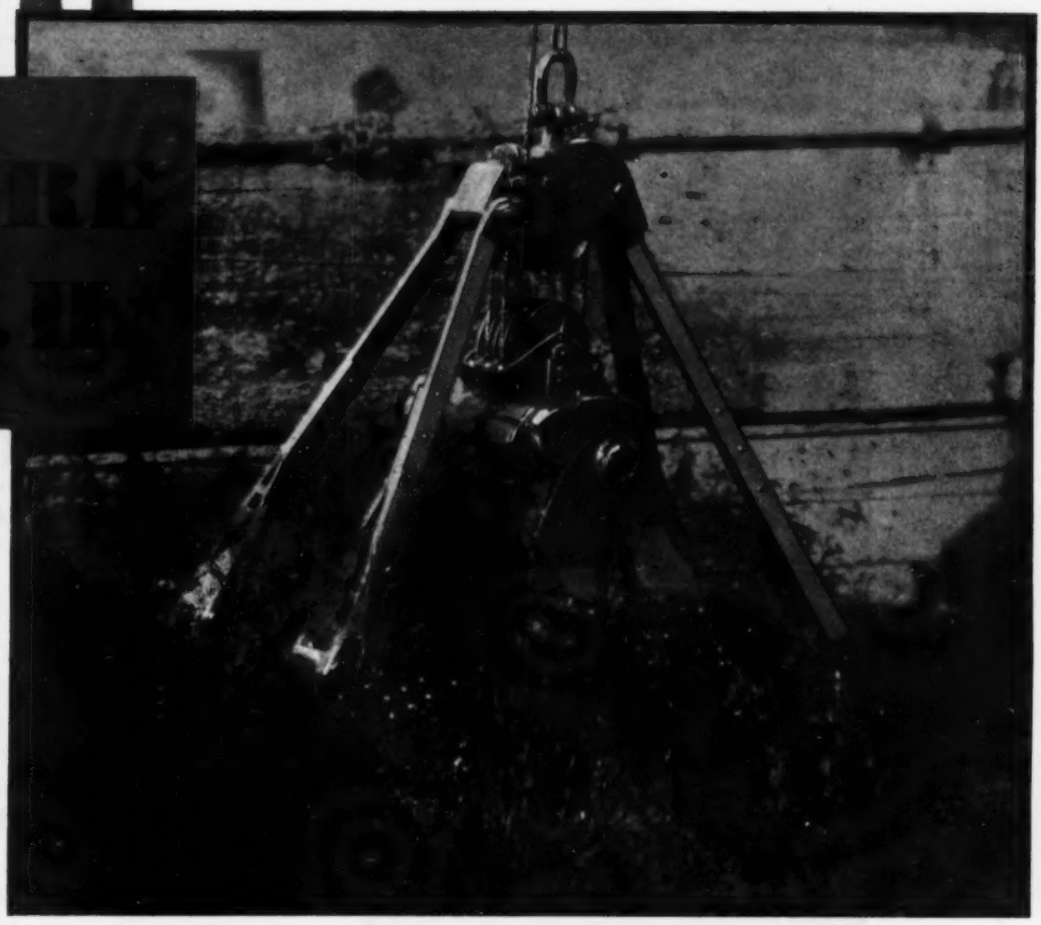
SENSIBLY DESIGNED — CAREFULLY ENGINEERED
CONSCIENTIOUSLY MANUFACTURED
HONESTLY ADVERTISED — FAIRLY AND MODERATELY PRICED

Write for complete information.

Factory and Main Office—Bay City, Mich. **Eastern Office—Roselle Park, N. J.**

BAY-CITY SHOVELS

THE BAY-CITY FAMILY OF FAST WORKERS



THAT'S WHAT MAKES AN OWEN A PAYING PRODUCER . . . .

★More Yardage Per Hour in an Owen clamshell bucket—like more miles to the gallon in a good auto—means *lower operating costs.*

More Yardage Per Hour—that's going through the job in the shortest time. Making every trip count. Biting deep, closing in the material, getting full loads every time—often overloads. Fast, clean dumping. Easy, smooth performance.

More Yardage Per Hour links the Owen Guarantee with every Owen Bucket—"A Bigger Day's Work Than Any Other Bucket of the Same Weight and Capacity."

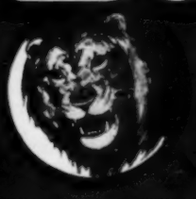
More Yardage Per Hour—that's why every Owen Bucket job is a profitable job.

Write us about the kind of work you have for a clamshell bucket, and we'll send definite data on the Owen that will do it for you with More Yardage Per Hour.

The Owen Bucket Company, 6023 Breakwater Avenue, Cleveland, Ohio

OWEN CLAMSHELL BUCKETS

Owen Buckets



See

the JOB through *with* CARBIC LIGHT

WHEN Carbic Flood Lights are part of your equipment, there is no need to fear the penalty clause or the loss of a bonus, if night work can make up for your delays.

Carbic Flood Lights are compact, self-contained, portable lighting units. Rugged and easy to use, they are always dependable for an emergency. They operate equally well in hot or freezing weather, and in wind, rain, hail or sleet.

Carbic Flood Lights are provided with a filter which frees the gas of moisture and solid particles. Maximum brilliancy of the flame and a constant volume of light are assured. All Carbic Flood Light Reflectors are chromium-plated. They are rust-and tarnish-proof.

These advantages of Carbic Flood Lights are further emphasized by the recent price reductions on Carbic, which total in most zones as much as $30 a ton. This greatly lowered fuel cost coupled with low first cost, makes it economical to use Carbic Flood Lights liberally wherever work must continue after sundown.

Sold by leading jobbers everywhere.

CARBIC

PROCESSED CARBIDE FOR CARBIC LIGHTS & GENERATORS

The new low price of Carbic is $6.00 a drum in Zone 1, $6.50 in Zone 2, and $7 in Zone 3. Write for Zone map.

THE LINDE AIR PRODUCTS COMPANY

Unit of Union Carbide and Carbon Corporation

126 Producing Plants — UCC — 627 Warehouse Stocks

IN CANADA, DOMINION OXYGEN COMPANY, LTD., TORONTO

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LINDE OXYGEN • PREST-O-LITE ACETYLENE • OXWELD APPARATUS AND SUPPLIES • UNION CARBIDE

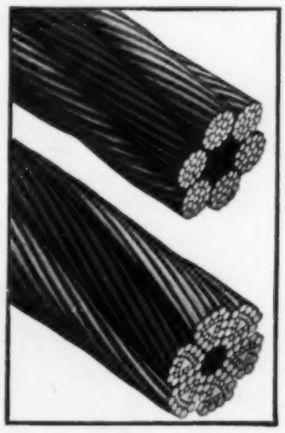
"HERCULES" RED-STRAND
REG. U.S. PAT. OFF.
WIRE ROPE

What Are Your Answers to These Questions?

Are you interested in the kind of wire rope that is dependable, even under extremely severe conditions? Do you want to minimize the time your equipment is idle while wornout ropes are being replaced? Do you consider final results more important than first cost?

If your answers to the above questions are "Yes"—then you owe it to yourself to give "HERCULES" (Red-Strand) Wire Rope a chance to show you just what it can do. Don't hesitate to try it on your hardest work.

There are good reasons why this wire rope is able to give such remarkable service, but the main point is that it does. Its service record continues to make and hold friends, for, after all, results are what count.



If you will tell us how you use wire rope, we shall be glad to suggest the construction of "HERCULES" (Red-Strand) Wire Rope that will be best for your conditions.

Feel free to write us about any wire rope problem that you may have.

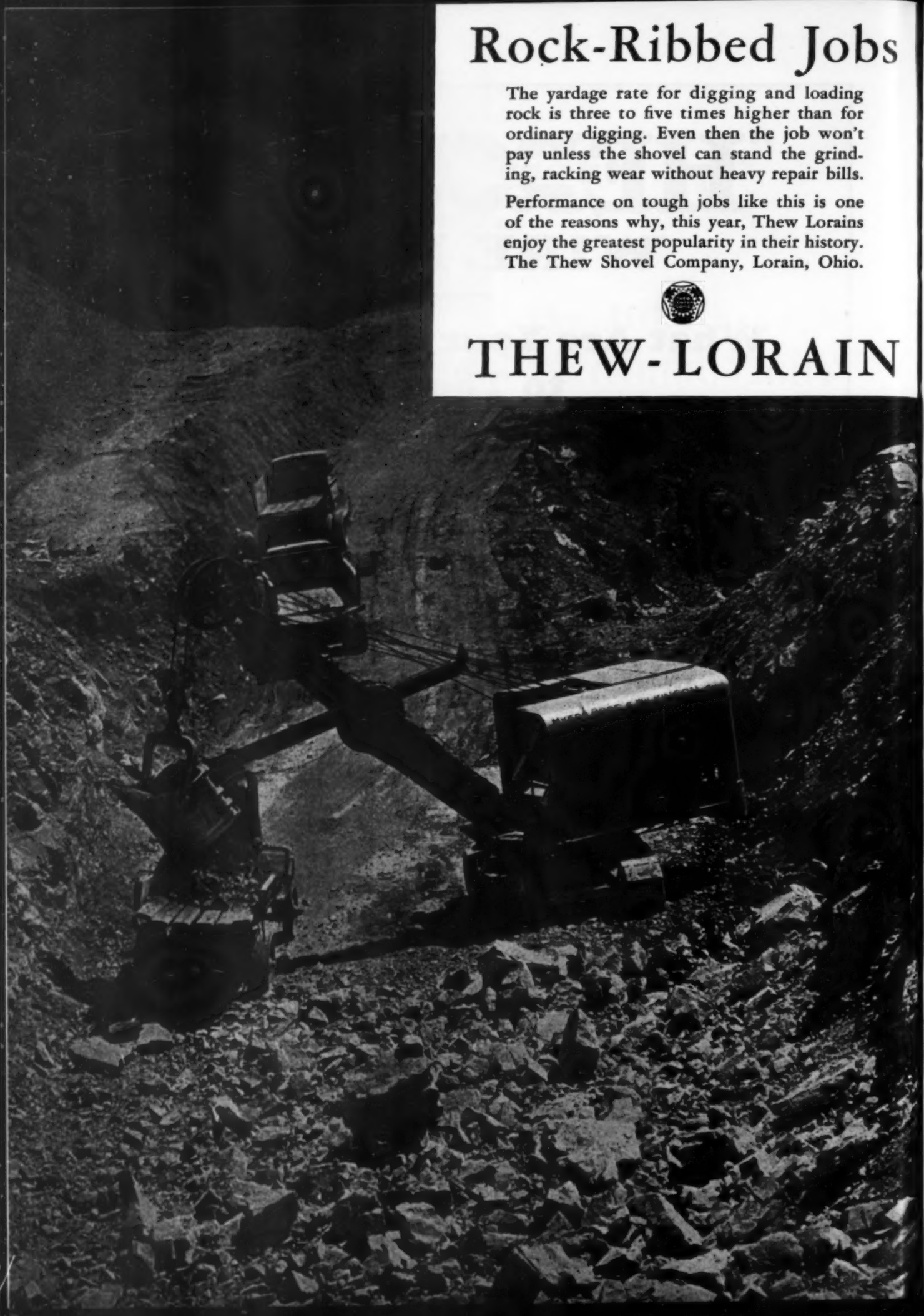
Furnished in "Patent Flattened Strand" and "Round Strand" construction in order to meet all working conditions

Made Only by A. Leschen & Sons Rope Co. Established 1857

5909 Kennerly Avenue
ST. LOUIS

New York Chicago Denver San Francisco

Distributors at over 100 different points. The name of our Distributor in any particular locality will be gladly furnished upon request.



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The yardage rate for digging and loading rock is three to five times higher than for ordinary digging. Even then the job won't pay unless the shovel can stand the grinding, racking wear without heavy repair bills.

Performance on tough jobs like this is one of the reasons why, this year, Thew Lorains enjoy the greatest popularity in their history. The Thew Shovel Company, Lorain, Ohio.

THEW-LORAIN

Construction Methods

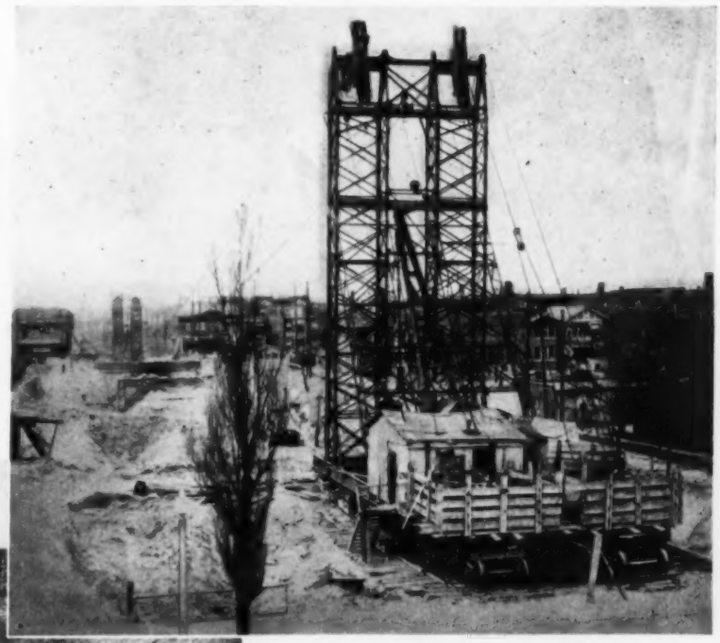
ESTABLISHED 1919—McGRAW-HILL PUBLISHING COMPANY, INC.

ROBERT K. TOMLIN. *Editor*

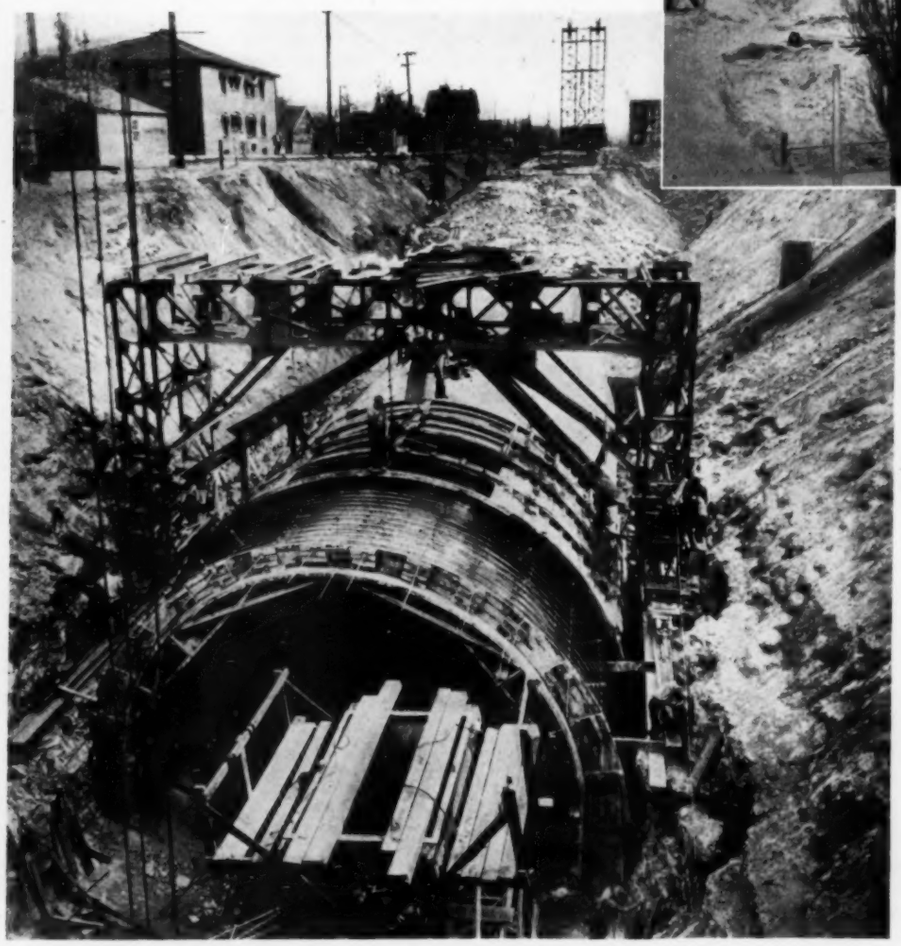
VOLUME 13 NEW YORK, DECEMBER, 1931 NUMBER 12

DUAL CABLEWAYS

Build Storm Sewer in Limited Working Area



HEAD TOWER of two cableways travels on backfilled trench.



STEEL AND CONCRETE for 32-ft. tube are delivered by cableway. Inside carrier and outside gantry move steel arch forms.

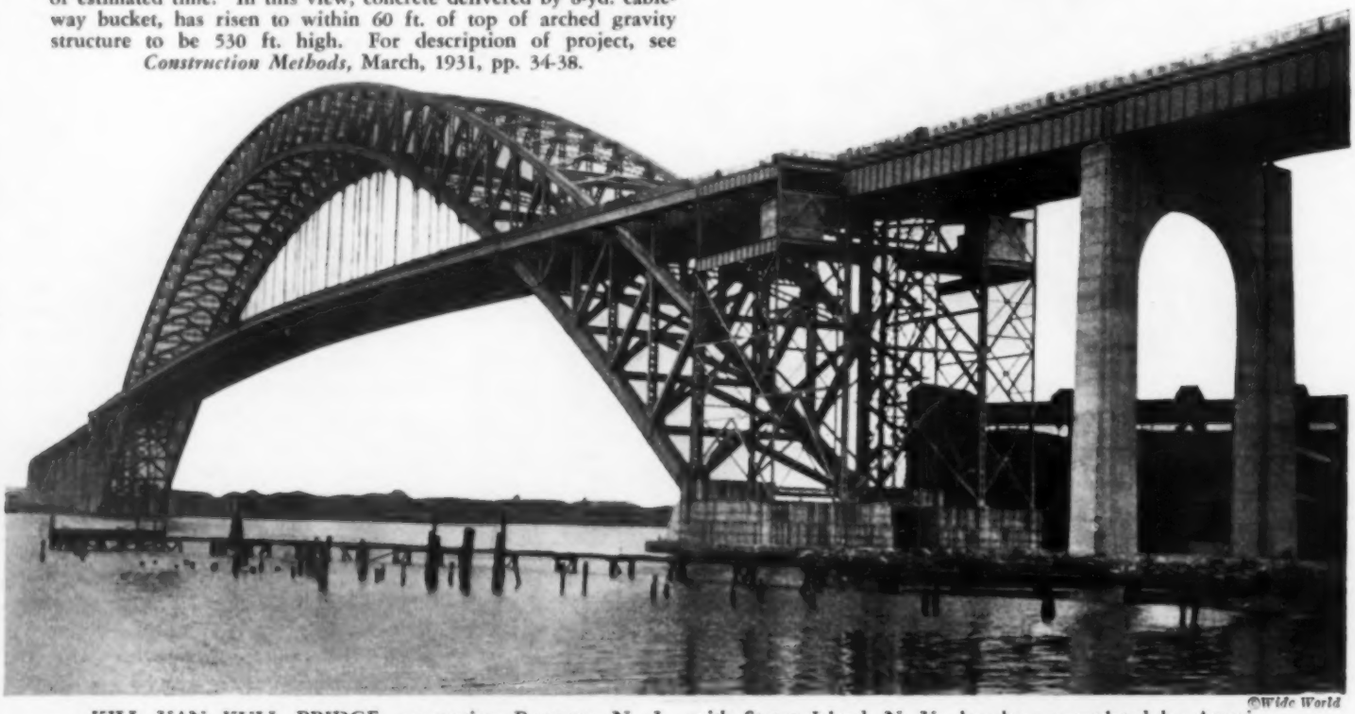
A DUAL-CABLEWAY unit traveling longitudinally with the sewer solved the problem of handling spoil on Section F of the River Des Peres storm-water sewer, St. Louis, for the Stiers Bros. Construction Co., contractor. Section F traverses residential and business sections where proximity of buildings prevented the contractor from using the banks for spoil piles. A mobile dual-cableway machine of 800-ft. span was erected with the tail tower traveling on the bottom of the trench and the head tower on the completed backfill. One cableway, operated by a G.E. 150-hp. electric motor, handled bucketloads of rock weighing 8 to 10 tons from the excavation to the backfill in one operation. The second cableway, driven by a 75-hp. motor, delivered steel and central-mixed concrete to the giant tube, 32 ft. in inside diameter and 2 ft. 10 in. thick. Both head and tail towers, each 75 ft. in height, were so designed that they could be lowered in passing under obstructions.

This Month's
"News Reel"

AHEAD OF SCHEDULE. On Nov. 1, Owyhee dam, being built in Oregon for U. S. Bureau of Reclamation by General Construction Co., of Seattle, was 88 per cent finished in only 71 per cent of estimated time. In this view, concrete delivered by 8-yd. cableway bucket, has risen to within 60 ft. of top of arched gravity structure to be 530 ft. high. For description of project, see *Construction Methods*, March, 1931, pp. 34-38.

©Acme

OPENED TO TRAFFIC. Motor cars cross Hudson River between New York and New Jersey on concrete roadways of 3,500-ft. cable suspension span of George Washington bridge, placed in service Oct. 25 by Port of New York Authority. Contractors for cables were John A. Roebling Sons Co., and for steel tower and floor erection, McClintic-Marshall Co. O. H. Ammann is chief engineer and M. B. Case construction engineer of bridge department of Port Authority.



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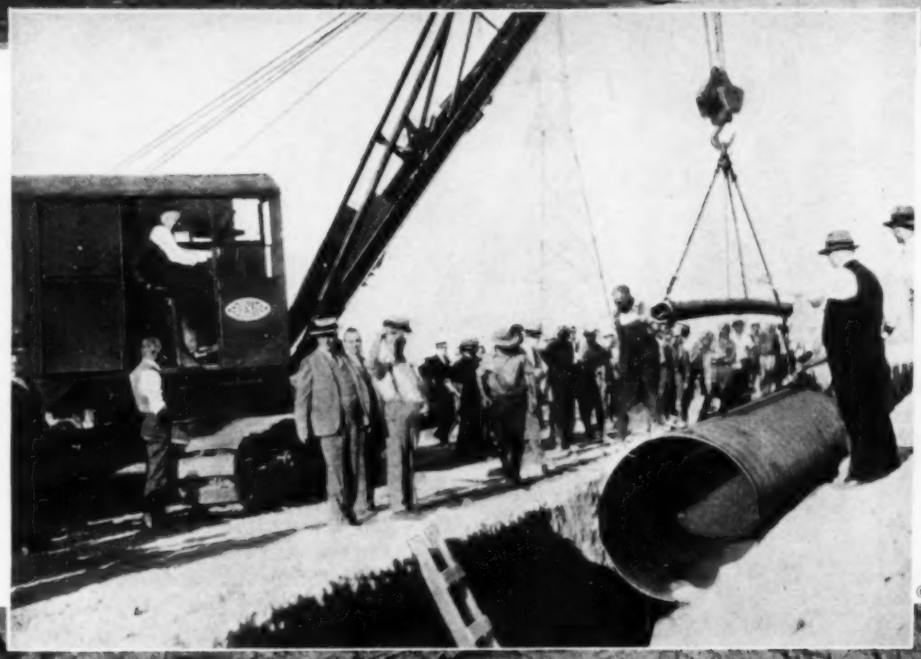
KILL VAN KULL BRIDGE, connecting Bayonne, N. J., with Staten Island, N. Y., has been completed by American Bridge Co., for Port of New York Authority and was opened to traffic Nov. 15. Structure has world's longest steel arch span, 1,675 ft. and total length, including approaches and plazas, of 8,750 ft. Steel erection involved successful use of falsework bents. Main stress-carrying members are of carbon-manganese steel.

TERMINAL HANGAR BUILDING has been constructed for Century Air Lines, Inc., at Chicago Municipal Airport. Structure, 220x160 ft. in plan, is of steel, concrete, face brick and limestone, designed by Huszagh & Hill, Chicago architects. Hangar proper has 200x160-ft. single span roof supported without intermediate columns by light steel trusses and large built-up girder across center.



FIRST LENGTH *(left)* of 62-in. steel pipe for San Joaquin valley section of San Francisco's 47½-mile Hetch Hetchy aqueduct delivered by Western Pipe & Steel Co. and laid by Youdall Construction Co. under supervision of Mayor Angelo Rossi.

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Union Pacific Photo

TUNNELING AT HOOVER DAM. Six Companies, Inc., advance one of four 56-ft. diameter bores through rock to divert Colorado River water around damsite and later serve as spillway channels. Platform on which drills are mounted is carried by motor truck to and from rock face between blasts. Immense size of excavation indicated by comparison with men on ladder at right.

COOPERATIVE CONTROL
by Subcontractors
SMOOTHS PROGRESS
on 40-Story Building

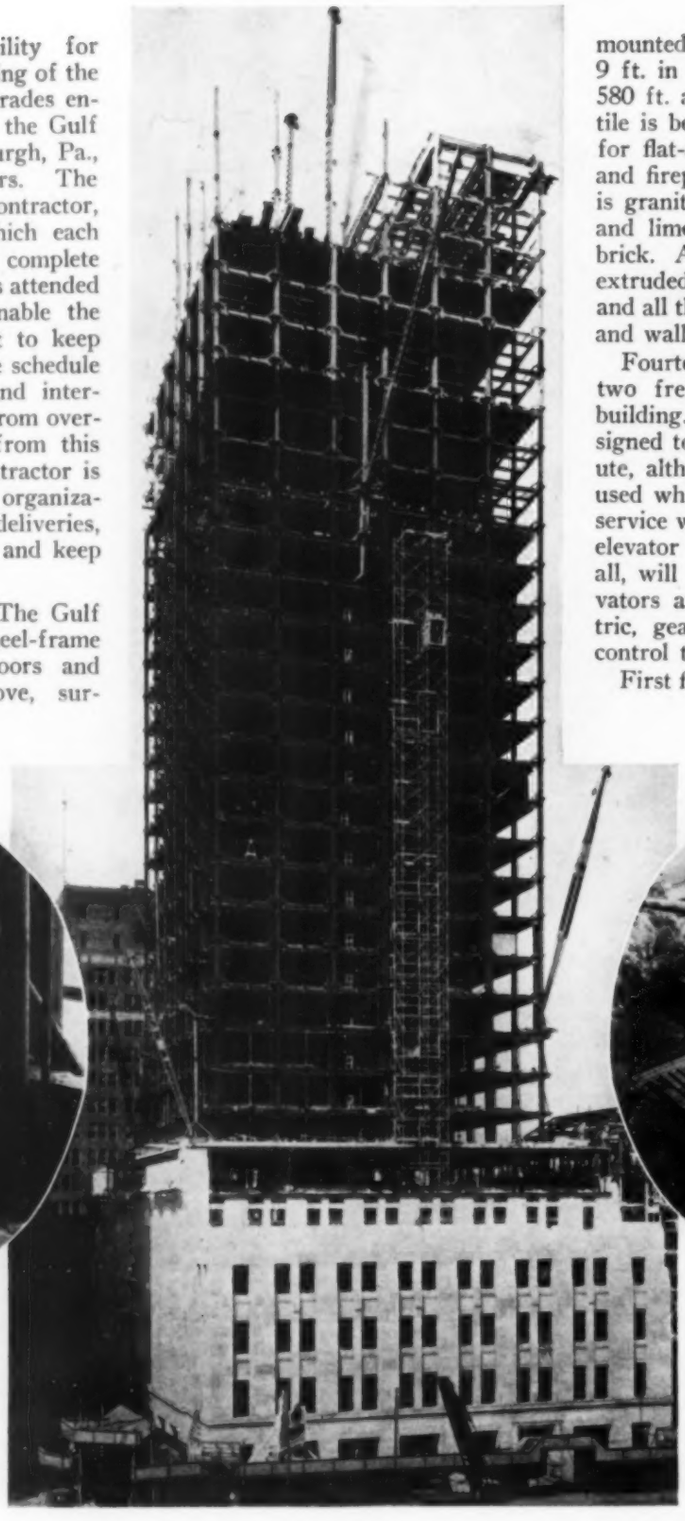
COMPLETE responsibility for the control and expediting of the operations of various trades engaged in the construction of the Gulf Refining Co. building, Pittsburgh, Pa., rests with the subcontractors. The Mellon-Stuart Co., general contractor, sets a definite period in which each subcontractor must start and complete his work, and weekly meetings attended by all the subcontractors enable the Mellon-Stuart superintendent to keep a check on all lapses from the schedule and to eliminate frictions and interferences which might result from overlapping operations. Aside from this general supervision, each contractor is made to depend on his own organization to maintain material deliveries, provide adequate equipment, and keep progress up to schedule.

Description of Building—The Gulf Refining Co. building is a steel-frame structure with 40 office floors and three additional floors above, surmounted by an octagonal stone ball 9 ft. in diameter, the top of which is 580 ft. above the street. Hollow clay tile is being used in the building both for flat-arch floors and for partitions and fireproofing. The exterior facing is granite up to the second floor level and limestone above, backed up with brick. All windows are solid aluminum extruded sections. The elevator lobby and all the corridors have marble floors and walls.

Fourteen passenger elevators and two freight elevators will serve the building. Five express cars are designed to operate at 1,200 ft. per minute, although the speed actually to be used when the building first goes into service will be 900 ft. per minute. All elevator openings, numbering 346 in all, will have bronze doors. The elevators are of the Westinghouse electric, gearless traction, full automatic control type.

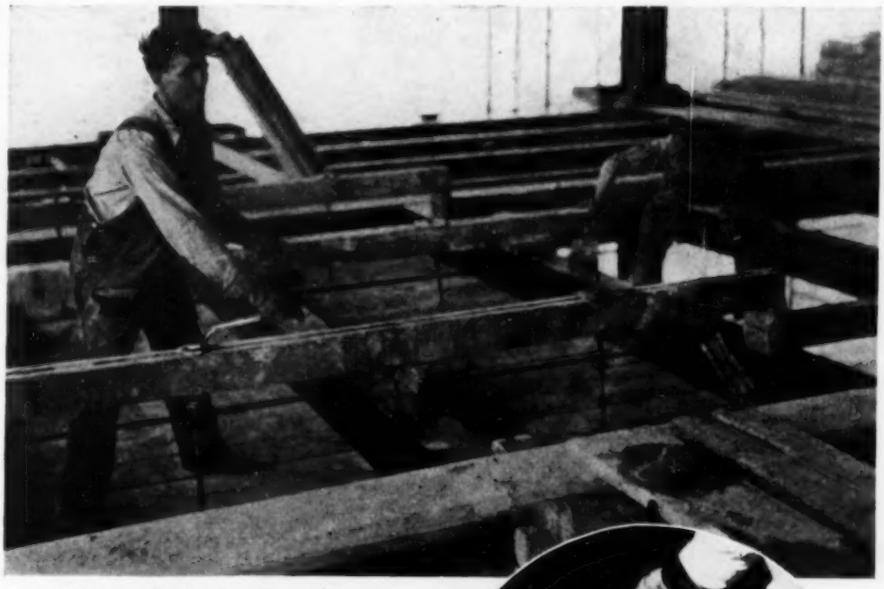
First floor dimensions of the building

COMMON BRICK is used to back up stone facing and to fireproof exterior columns. Mortar is mixed and delivered to bricklayers on floor where wall is being built.



40-STORY STEEL-FRAME OFFICE BUILDING *(left)* under construction. Two guy derricks erect structural steel, and stiff-mast derricks hoist granite and limestone facing. FLOORS *(in oval, above)* are of hollow-tile flat arch construction.

are approximately 196 ft. 6 in. on Seventh Ave. by 135 ft. on Grant St. and William Penn Way. The building stands on a hillside, the sidewalk elevation at Grant St. being practically 11 ft. above that at William Penn Way. At the fifth floor level the building is set back approximately 24 ft. on each of the two sides facing Grant St. and William Penn Way. A second setback on four sides at the seventh floor level reduces the floor area to 113 ft. square. The seventh is the first tower floor. From the 11th to the 32nd, the floors are identical in dimensions, 108x108 ft. Above the 32nd, floors are set back progressively to the 40th, which is 42 ft. 8 in. square. The observation floor, immediately under the octagonal stone ball, is 11 ft. 8 in. by 11 ft. 8 in.



PANEL FORMS for flat arch construction are suspended by long bolts from wood joists supported by steel beams.

Weekly Meetings—The meetings held once each week in the office of John G. Fagin, superintendent for the Mellon-Stuart Co., last several hours. A thorough discussion deals exhaustively with all the factors affecting progress. The superintendent asks specific questions of each subcontractor's representative, and the interchange of ideas among all those present leads to an effective cooperative program for the ensuing week. Among the subjects discussed are general job-organization, record of the past week as compared with the schedule, deliveries of materials, division of unloading and storage space, condition and adequacy of equipment, relative progress of the various trades (with particular reference to the effect of each trade's progress upon that of those following it), interference caused by overlapping operations, size of construction crews, and availability of equipment and skilled labor for future needs.

A stenographic report of each meeting is kept on file in the superintendent's office. Copies of those portions of the report relating to work on the various subcontracts are given to the foremen concerned.

Once the program for the following week has been determined at the meeting and copies of the reports have been placed in the hands of the responsible persons, it devolves upon the subcontractor and his foremen to see that their operations conform to the plan. Only in case of failure to execute their work according to schedule is it necessary for the superintendent to exercise his authority over the subcontractors. A high degree of cooperation between the general contractor and the subcontractors and elimination of friction among the subcontractors themselves are the two greatest benefits derived from this decentralized system of control.

Foundations—Caisson piers resting on bedrock and additional foundation substructure for the building were constructed by the Booth & Flinn Co., Pittsburgh. The 4-ft. thick sub-basement perimeter walls and floor, requiring a total of 1,300 yd. of concrete, were poured by the Mellon-Stuart Co. with ready-mixed batches delivered by agitator trucks .

Structural Steel—Steel for the structural frame, amounting to 12,800 tons, was fabricated by the McClintic-Marshall Corp. and was erected by John L. Mullen, of Pittsburgh. To handle the heavy columns and girders on the lower floors, the erector used two 35-ton guy derricks with 110-ft. masts and 100-ft. booms. Above the 6th floor, the same derricks were employed, but the masts and booms were each shortened 20 ft. These derricks erected steel to the 37th floor, upon which they set a 15-ton derrick with 90-ft. mast and 80-ft. boom. The lighter derrick dismantled and lowered the two heavier derricks and topped out the steel frame.

Hoist Motors—The two hoists operating the steel erection derricks, as

KEY TILE *(left)* of flat arch is dropped into place. Joints between tiles are filled with mortar.

CONSTRUCTING FLAT TILE ARCHES on panel forms suspended from joists. Runways for wheelbarrows are laid on joists supporting forms.

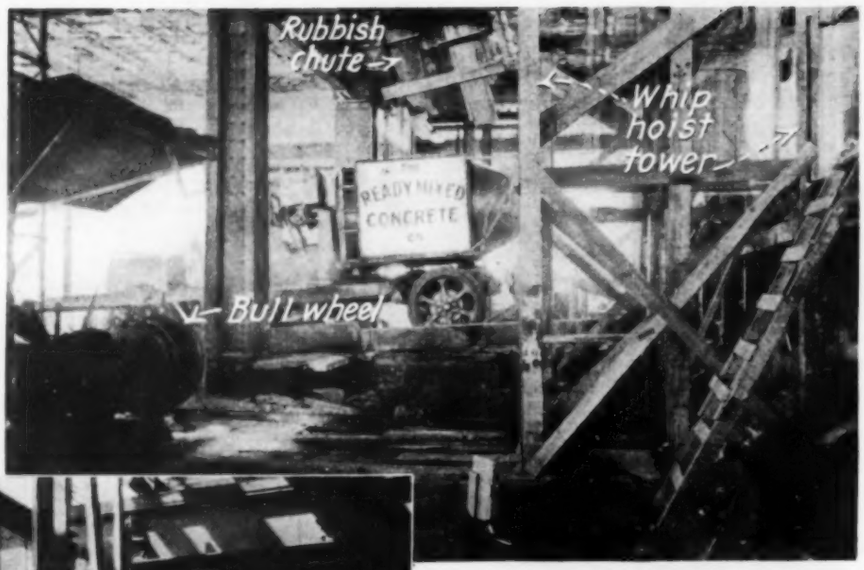
well as all other hoists on the job, were driven by electric motors. At one time, the steel erector, the stone setters, the tile arch crew, the bricklayers and the general contractor had a total of 13 electrically-driven hoists operating guy derricks, stone derricks, and tower elevators.

Gasoline motors were used on the job to drive the steel erector's two compressors, a large Sullivan stationary machine and a smaller Chicago portable, and to turn the mortar mixers and a subcontractor's small concrete mixer.

Plant Layout—Three entrances to the building, on different levels, served as truck driveways for the delivery of materials. Because of the layout of the building, it was more convenient for the contractor to erect tower hoists adjacent to the Grant St. and William Penn Way entrances than to attempt to use the permanent elevator shafts for hoisting materials. The Mellon-Stuart Co. erected two double-compartment American tubular steel towers at the points indicated on the diagram. These towers extend through the roof at the seventh floor setback and continue upward outside the building.

The two hoist platforms in each tower are unequal in capacity, one being designed for three wheelbarrows and the other for two. The compartments are numbered as indicated. Nos. 1, 2 and 3 extend 12 ft. above the 38th floor; but No. 4 rises to the full height of the building. A 50-ft. span between No. 4 and the observation floor is bridged by use of tubular steel tower sections resting on the building setbacks.

Three of the tubular tower hoists are used as needed by the general contractor and various subcontractors. No. 1 hoist is operated exclusively by the subcontractor for the brickwork.



READY-MIXED CONCRETE for general contractor is delivered by agitator truck. Bull wheel on small hoist at left operates whip hoist in wood tower at right.

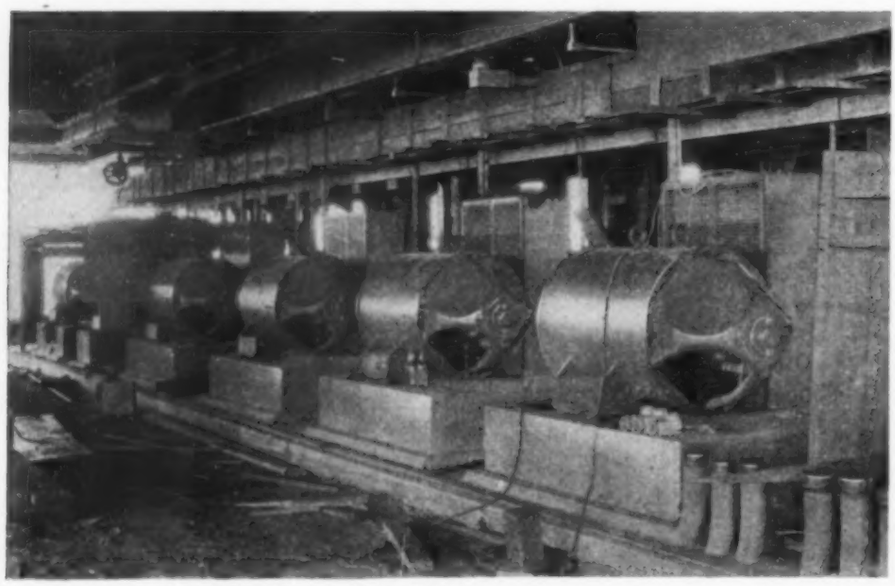
WHIP-HOIST CAGE at upper floor. Other cage on continuous rope is being loaded at ground floor.

Hoists No. 3 and No. 4 are driven by American single-drum engines powered by 100-hp. G.E. motors. These hoists have a speed of 900 ft. per minute. Hoist No. 2, with a speed of 650 ft. per minute, is operated by a Lidgerwood two-drum engine powered by a Westinghouse 100-hp. motor. The brick subcontractor operates the cage in No. 1 tower at a speed of 900 ft. per minute with a Lidgerwood single-drum hoist driven by a 100-hp. G.E. motor.

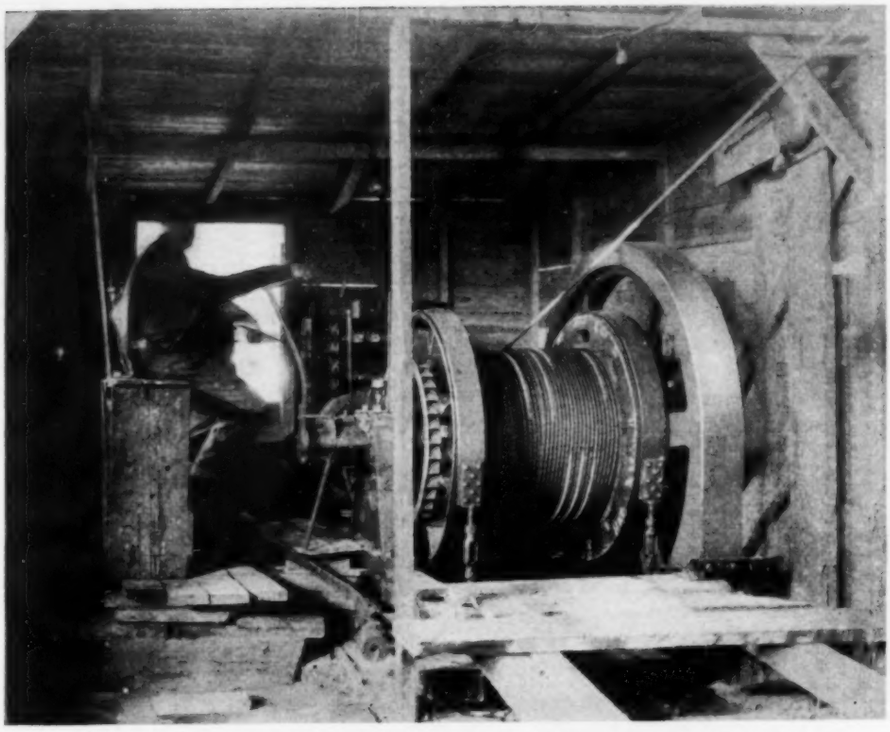
Tile Arch Floors—The Camp Construction Co,. of Cleveland, subcontractor for the tile arch floors, has two whip hoists in wood towers. Each whip hoist is equipped with two reciprocating platforms of one-wheelbarrow capacity. One of the whip hoists extends to the 20th floor and the other to the 37th. The two platforms of each whip hoist are linked into a continuous rope which has three turns on the bull wheel of a small Lidgerwood hoist powered by a Westinghouse 45-hp. motor. One platform makes a down trip while the other travels upward. All materials are hoisted in wheelbarrows on these platforms. Mortar is mixed on the floor being laid.

Steel I-beam floor joists are spaced approximately 6 ft. c. to c. Wood panel forms to support the tile arches during construction are suspended on threaded rods hung from timber joists blocked up on the steel I-beams, as illustrated by one of the photographs.

Stone Setting—John McBeath & Sons, of Pittsburgh, subcontractors for the stone setting, erected 18,500 cu.ft. of granite, supplied by the John



MOTORS for intermediate bank of electric elevators.



SINGLE-DRUM ELECTRIC HOIST operates brick subcontractor's elevator at speed of 900 ft. per minute.

Swenson Granite Co., Concord, N.H., on the four sides of the building up to the second floor level. Above the second floor, about 300 carloads, or 200,000 cu.ft. of Shawnee Carrara two-tone limestone from Bloomington, Ind., is being placed.

For all the stone hoisting, John McBeath & Sons use a form of steel stiff derrick, with a long boom and a comparatively short mast. Instead of being braced by stiff-legs, the mast is tied back to the structural frame of the building. The foot block is supported either on a setback or on cantilever beams. Four of these derricks hoisted stone up to the seventh floor setback. Above this setback, two derricks on cantilever supports, one on the 23rd floor and one on the 25th, raise the stone on boats from trucks to platforms at the designated floors. Each stone boat is loaded with two to twenty pieces weighing a total of 3½ to 4 tons. The stone is distributed on the floor by hand trucks and is set with Sasgen manually-operated boom hoists or breast derricks.

Fifty-Ton Lintel—A solid block of granite, 31 ft. 6 in. by 8 ft. 3½ in. by 2 ft. 9 in., weighing 100,800 lb., forms the lintel over the main building entrance. This stone was quarried and shipped from New Hampshire in one piece. An 8-wheel trailer transported it from the railroad freight yard to the building site. After three hours' preparation, the two derricks on the Seventh Ave. side of the building erected it in place, on lead joints, in 50 minutes.

Concrete—Only small pours of 1½ to 5 yd., in machinery floors and electrical conduit shafts, are required in the upper portion of the building. The Mellon-Stuart Co. is making these pours with ready-mixed concrete.

A two-bag mixer, batched by wheelbarrows, is being used by the Navarro Co., of Pittsburgh, subcontractor, to pour the 4-in. reinforced-concrete slab on the basement and first floors and to mix 550,000 sq.ft. of cement floor finish. The Navarro Co. also fireproofed the beams and columns on the basement and first floors with this mixer.

Concrete for the small pours of the Mellon-Stuart Co. is delivered by agitator trucks to a small hopper in the basement. Hand buggies transport the concrete from this hopper, by way of the hoist, to the upper floors. Rubbish is disposed of by a chute from the upper floors discharging directly into trucks on the driveway.

Brickwork—Backing requiring 5,000,000 common brick is being laid by John B. Kelly, of Philadelphia. The brick are unloaded on the first floor and are taken up by Hoist No. 1 in wheelbarrows, to be dumped in convenient locations on the upper floors. Mortar is mixed on the floor where it is being used.

Management—For the Mellon-Stuart Co., John G. Fagin, superintendent, manages the job under the general direction of Roy A. Clark, chief engineer. The architects for the building are Trowbridge & Livingston, with E. P. Mellon as associate, all of New York. Their representative is C. W. Hall. Weiskopf & Pickworth, of New York, consulting engineers for the architects, designed the structural steel. E. E. Appel, engineer, represents the Gulf Refining Co.

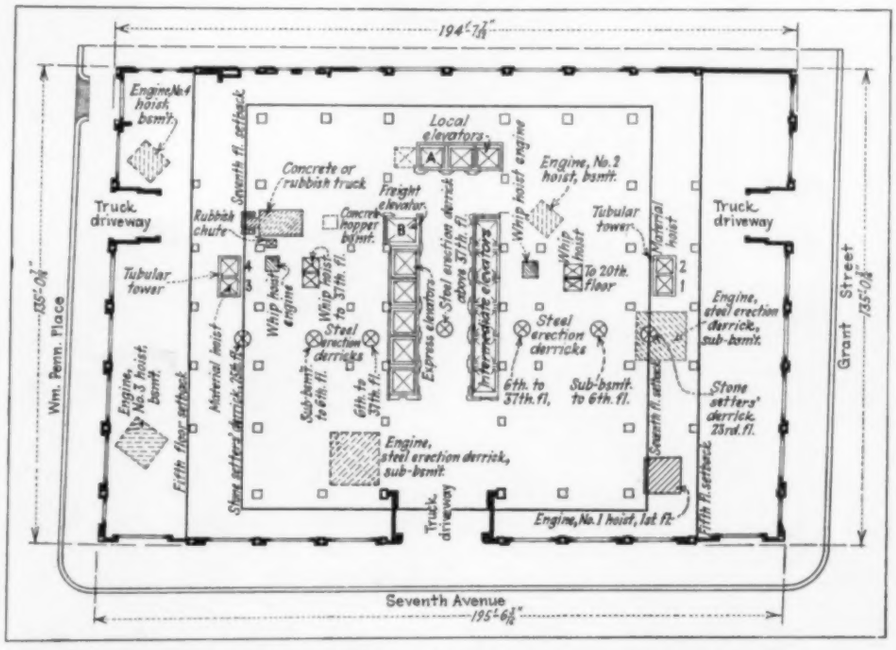


DIAGRAM OF PLANT LAYOUT, showing column locations on first floor. Building setbacks are indicated. Three permanent entrances serve as truck driveways. Truck is in position to receive load of rubbish or discharge load of concrete into hopper in basement. Elevator A is used first to transport workmen as far as eight floor. Elevator B later extends this service to 38th floor.

Large Steel Pipe Protected by WRAPPING OF CEMENT

OF the 47 miles of steel pipe line now being laid across the San Joaquin Valley in California as one of the final steps in bringing Hetch Hetchy water to San Francisco, contract was signed in May this year for about 26 miles of steel pipe wrapped with cement mortar. This part of the line has diameters of 56 to 66 in. The wrapping consists of a layer of cement mortar, ½ in. thick, within which are included two layers of fabric, one a wire mesh and the other a cotton cloth.

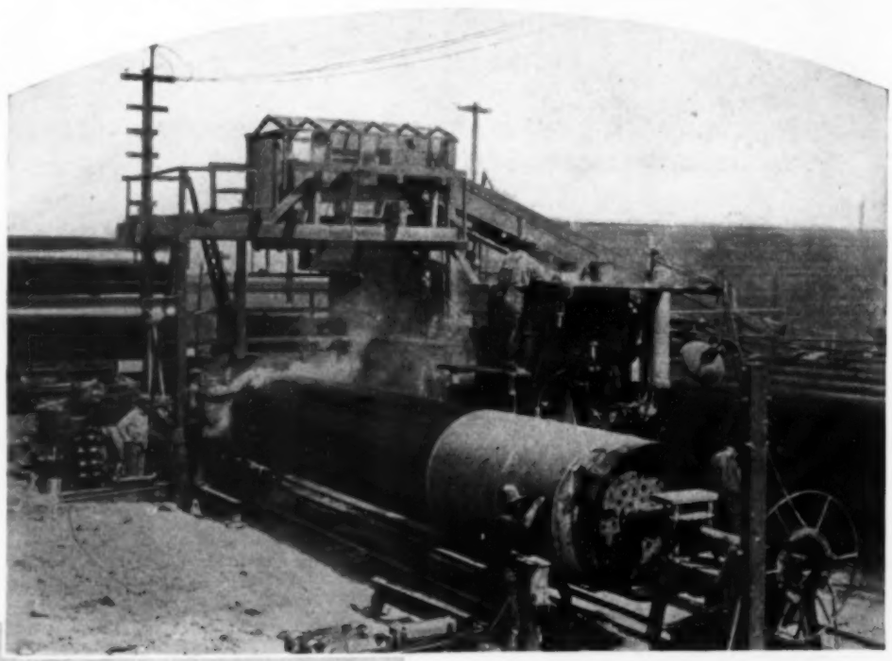
Wrapping is done by machines of novel design and recent development, the first large units of their kind having been built expressly for this work. The first wrapping plant went into operation on Aug. 18 at Vernalis, about 12 miles south of Tracy, Calif. By Oct. 1 the plant had wrapped 38,300 lin.ft. of pipe, and during this time the rate of production had increased to as much as 1,400 lin.ft. in 8 hr.

The Vernalis plant had only one runway or curing row. Although this runway was 400 ft. long, pipes of the largest size, particularly, required more space if the full capacity of the machine was to be stored for 24 hours before handling. Accordingly, the second wrapping plant, located at Modesto, was laid out with four parallel curing rows, each 420 ft. long, a transfer platform being used to deliver newly wrapped pipe to any row. The Modesto plant, which was put in service Oct. 12, is planned to average 2,400 lin.ft. of wrapped pipe per day of two 8-hr. shifts. The following description and the accompanying illustrations relate to the Vernalis plant.

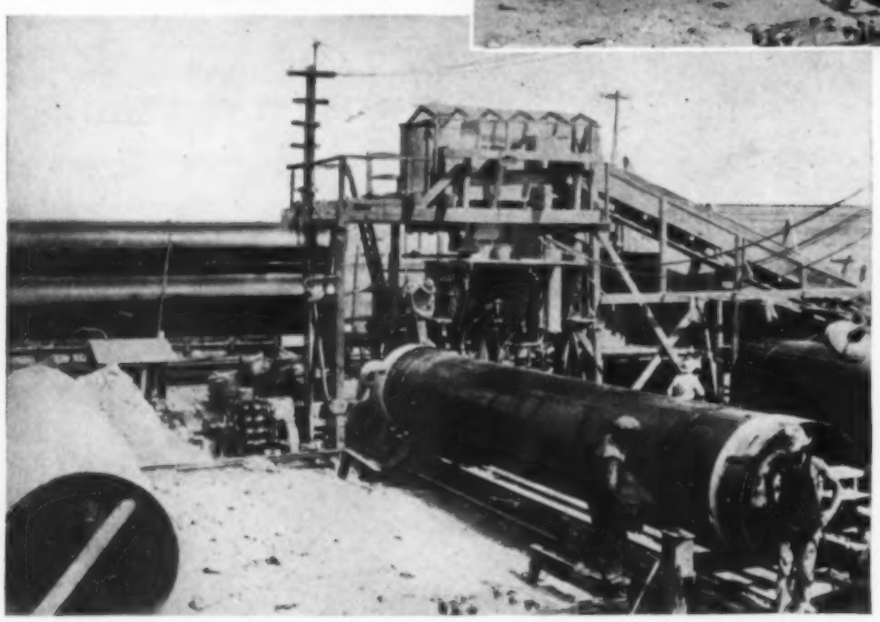
Materials Handling—Sand is unloaded from gondola cars by a Byers crawler crane operating a ½-yd. grab bucket which delivers to a large storage bunker at track level. Beside the storage bunker stands an elevated 8-yd. hopper served by the same grab bucket.

From the hopper sand moves by gravity through a radial gate to a motor-driven Niagara Counterflow screen of ⅜-in. mesh. Passing through this screen, the sand drops into a bottom-dump car standing on rails. This car is equipped with scales for weighing the sand, and the operator who watches the scales controls the gate from the hopper.

The sand car, loaded with a batch which bulks about 20 cu.ft., is moved a few feet by hand to one end of the cement shed. Cement is delivered to the job in 94-lb. paper sacks, ten of which are dumped into each car of sand after being passed through a screen to make sure that no foreign matter gets into the batch. Yosemite One-Day quick-setting cement is used, and the mortar shows a strength



ROTATING PIPE gets coating of spirally wound cement mortar with fabric imbedded. Man in foreground is attaching tape band just below fabric clamp. At left hot tar is being painted over skid marks.



STEEL PIPE section 30 ft. long is placed between rotating heads of wrapping machine. Wrapping carriage stands beneath materials hopper. Note rail extension under man with tar bucket. Wrapped section in left foreground.

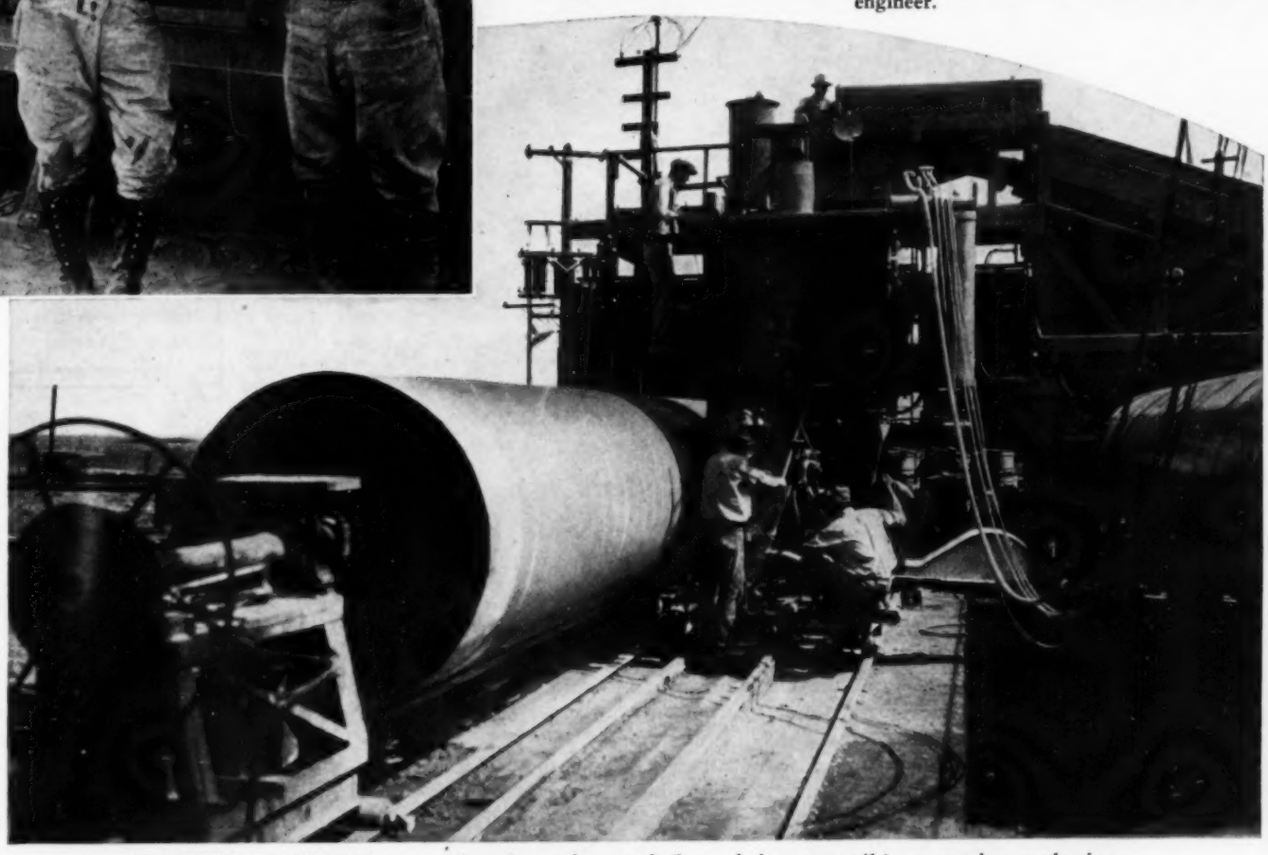
New Type of Machine-Wound MORTAR AND FABRIC

of 4,000 lb. per square inch in 24 hr.

The dry batch of sand and cement is discharged through the hopper bottom on to an inclined conveyor belt and is elevated to a hopper above one end of the track used by the carriage of the wrapping machine. It remains there until the mixer moves into position to receive it. Water for each batch, which is drawn from a charging tank mounted on the mixer frame, is added in the mixer after the dry batch has been turned over a few times to obtain preliminary mixing.

Wrapping Machine—Cement mortar of relatively dry consistency is wrapped around 30-ft. sections of steel pipe by a machine which slowly rotates the pipe while a carriage that

CURING ROW is 400 ft. long. Pipe sections stay here until they can be handled safely. W. F. FOSHA *(left)*, assistant designing engineer of Cement Wrapped Pipe Co., and PAT KERNAN, inspector for San Francisco city engineer.



WRAPPING CARRIAGE moves along its track geared (by rack between rails) to rotating mechanism so spiral wrapping is uniform. Flexible connections for air, water and electricity, in right foreground, maintain these services during movement of carriage.

puts on the wrapping moves lengthwise alongside. Mounted on top of this carriage is a Master 28-cu.ft. paddle-type mortar mixer which delivers by gravity to the mechanism beneath. The mixer is driven by a 30-hp. motor, and compressed air is used to gain rapid movement of the carriage in its return along the track from finishing to starting position.

When ready for wrapping, a pipe section is fastened between the two rotating heads alongside the wrapping carriage track, and the same motor which rotates the pipe sections, by suitable gear reduction, also advances the wrapping carriage along the track, thus assuring a uniform spiral wrapping. The advance along the track is 12 in. for every revolution of the pipe. About $\frac{5}{8}$ in. of this advance constitutes overlap in the mortar coating.

Put on in conjunction with the cement mortar are two layers of fabric, one cheesecloth and one wire mesh. Both help to support the mortar while it sets and this function, plus the aid given in obtaining a smooth finish, is all that the cloth is expected to do. The wire mesh, however, performs a dual service, the second function, described later, being the more important.

With the wrapping carriage in starting position, first the wire mesh and then the cloth is drawn forward from the carriage table and fastened to the pipe section by a clamp which can be bolted to the pipe at any part of the circumference through the rivet holes at the end. The direction of rotation is such that the bottom of the pipe section is turning away from the carriage.

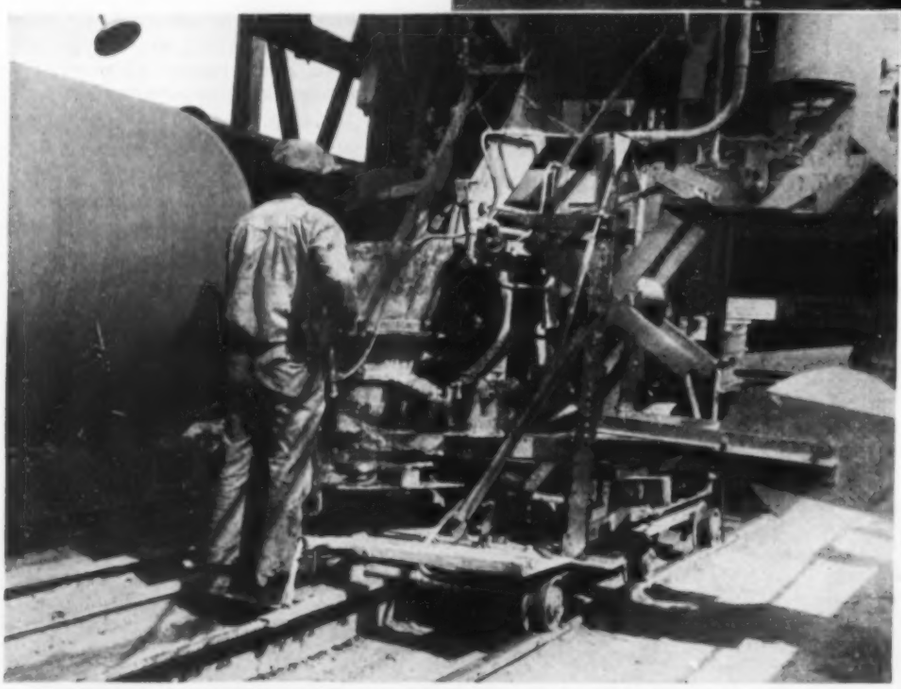
With the fabric fastened, rotation of the pipe section is begun, and simultaneously the wrapping carriage starts its lengthwise movement along the pipe. As the fabric is unwound, cement mortar is fed down from the mixer through a hopper to the slightly inclined chute or "table" 12 in. wide which leads to the point of application at the bottom of the rotating pipe. At the bottom of this hopper is a $\frac{1}{2}$-in. slot extending the full 12-in. width of the table. Mortar comes through this slot in a $\frac{1}{2}$-in. ribbon and, with the wire fabric, moves along the table toward the rotating pipe. Mounted on the steel sides of the hopper are two small pneumatic hammers, the tapping of which makes for uniformity of delivery and density.

The wire fabric is 12 in. wide, just fitting the table width. The cloth is $12\frac{1}{2}$ in. wide. Both metal and cloth fabric are brought to the machine in rolls which are mounted at convenient location to be unreeled by the tension from the rotating pipe to which the fabric is attached. The wire fabric is made of No. 25 steel wire and has a mesh of five to the inch. It is delivered in rolls of slightly over 1,000 lin.ft.

The tension on the reel of wire fabric, which determines the position of the fabric in the mortar coating, is regulated by a triple roller device through which the fabric passes in transit from reel to pipe. Hand adjustments are provided to regulate the relative position of the rolls. Tension can be increased further by hand pressure on the reel applied so as to tighten the winding.

The tension required to place the wire fabric in the middle of the mortar coating has ben found by experiment. By careful attention to this tension, the location of the fabric is closely controlled. For the materials and conditions at Vernalis, a tension of 200 lb. on the unreeling fabric produced a stress of about 10,000 lb. per square inch in the steel wires

PADDLE-TYPE MIXER mounted atop the wrapping carriage feeds down ½-in. ribbon of mortar to be wrapped onto pipe surface rotating at peripheral speed of 125 ft. per minute.



CLOTH AND METAL FABRIC (seen in rolls at right) are imbedded in mortar coating before it is pressed into place on pipe.

when wrapped around the pipe. To this stress, applied before the mortar sets, is ascribed the toughness and resiliency of the coating. No shrinkage cracks in the mortar have been found inside the wire mesh.

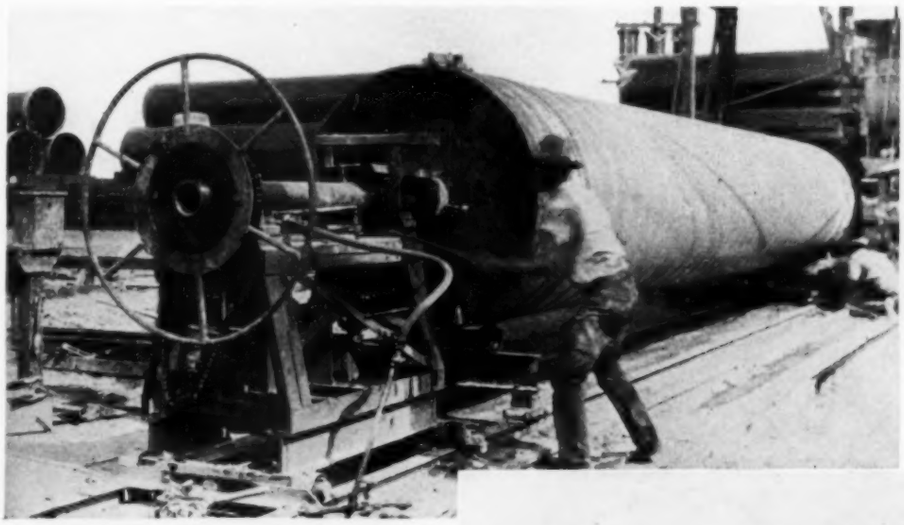
The cloth fabric travels immediately beneath the table and, near the pipe, passes upward through a slot so as to join the ribbon of moving materials just before it is pressed against the rotating pipe surface. The cloth is thus wrapped on as an outer surface covering. In fact, it would be entirely outside the mortar were it not that the tapping of a pneumatic hammer brings moist mortar through the mesh of the cloth.

The entire table is mounted upon an axle about midway of its length, and a counterweight on the end away from the pipe causes a uniform upward pressure at the point of application. In addition, a small pneumatic hammer mounted on the under side of the table end, just beneath the line of application, taps continually as the materials are pressed upward against the rotating pipe surface. The uniform pressure and the pneumatic hammer combine to give a compact pipe covering with a smooth and uniform surface regardless of any departure from a truly circular pipe section.

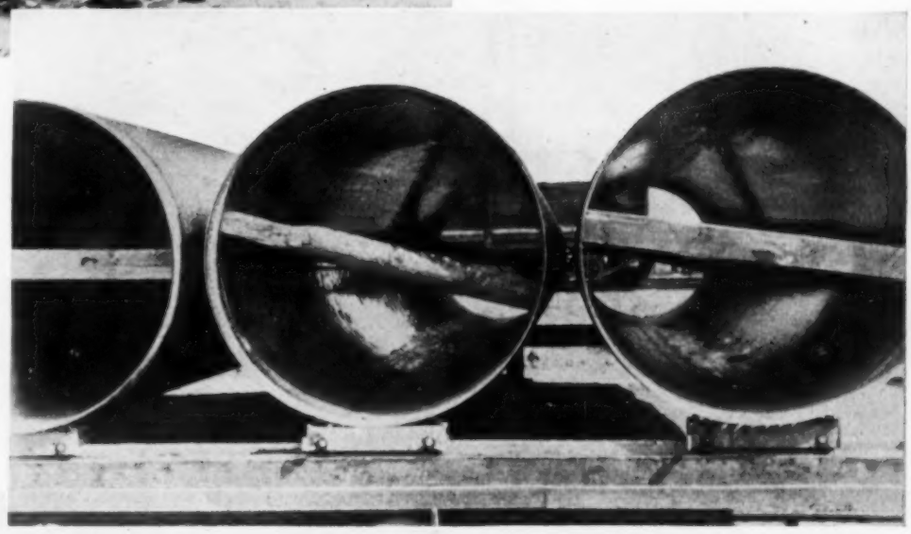
When the wrapping of a pipe section is completed, the fabrics are fastened at the finishing end by a clamp, and just beyond the clamp the fabric is cut with snips to release the wrapping carriage. To make a good finish at the ends and to insure holding materials in place during setting, a few thicknesses of electrician's tape are put on at both ends while the pipe is still rotating. This tape is applied as a circumferential band at the point specified for the mortar wrapping to terminate.

The device that holds the tape reel also has a hand-operated cutting wheel which makes a clean circumferential cut alongside the tape band. That portion of the wrapping between the tape band and the pipe end is pulled off by hand and any mortar remaining beneath is scraped off with a hoe, the continued rotation of the pipe aiding both these processes. The mortar coating terminates along a line 6 in. back of rivet hole centers.

The Rotating Heads—The pipe sections are rotated by being wedged between two heads, as in a lathe, each head being provided with a power-driven mechanism. One of the heads is equipped with a compressed-air-driven screw by which the head can be moved along the pipe axis. This movement is used to force the two heads toward each other after the pipe is delivered between them. By means of tapering wedges which enter both ends of the pipe the converging heads raise the pipe section off its rail supports. The rails then can be swung out of the way affording clearance for rotation. This



REMOVAL OF COMPLETED SECTION is accomplished by drawing back one of rotating heads (at left), thus lowering pipe onto dollies waiting to receive it on rail extensions.



STRUTS, placed at right angles to diameter connecting longitudinal welds, help to keep pipe sections round. Note 2x4-in. spacers between dollies to keep pipes apart.

SPRAYED ASPHALT EMULSION is used in curing mortar coating, but it is applied without rotating sections, which are kept on dollies for 24 hr.

operation is reversed in lowering the pipe.

The crew on the wrapping machine totals six men: mixer man, machine operator (foreman) and helper, tar bucket man and two men handling fabric clamps and tape bands. In addition to these, the steel pipe handling crew of two men roll pipe sections in between the rotating heads and the curing row crew takes charge of the section as soon as it is set out on the rails away from the rotating heads. The application time required for coating a 30-ft. section is about 4½ min., or a peripheral speed of about 125 ft. per minute.

After the wrapping is completed the pipe is moved on small dollies, one under each end of the pipe, designed to roll along the rails in the curing yard. Each dolly has two double-flanged wheels set in a piece of steel plate bent into the form of a channel iron with short lengths of angle iron on top to keep the pipe section from rolling off. The dollies run on strap-iron rails set on top of timber stringers in the curing yard.

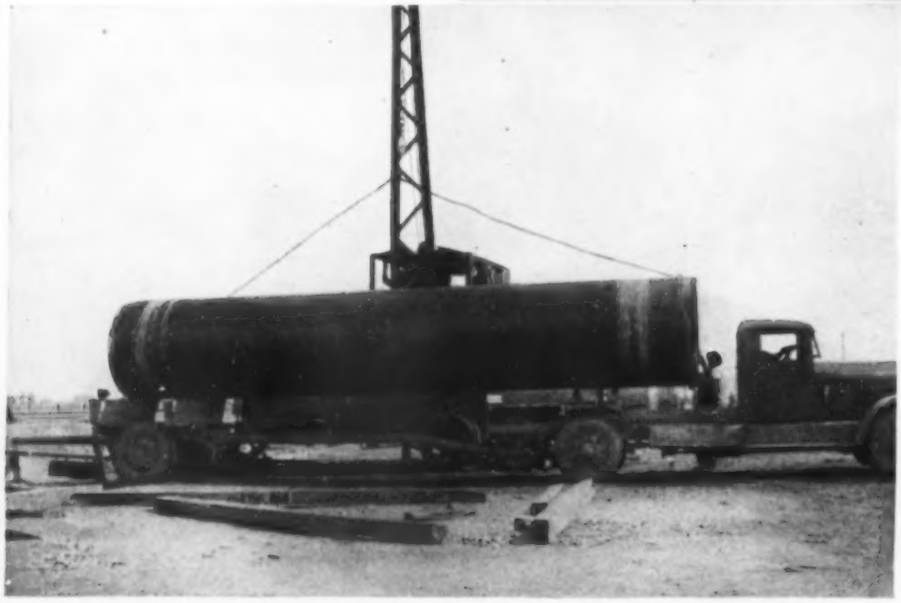
Diameters of pipe wrapped by this machine vary from 56 to 66 in. For the most part, the wrapping is made ½ in. thick, although on about a mile of pipe line in lowland where extra protection is required, two 1-in. coatings are to be applied successively, the second coating being put on immediately after the first to assure bond between the two layers. Neither the wire nor the cloth fabric ever is spliced in the wrapping machine. The length of fabric in each roll is, by arrangement with the mill, slightly more than some multiple of the number of feet required for each pipe section, thus eliminating need for splices.

When a pipe section is lowered onto the dolly supports, the two longitudinal seams are placed at top and bottom to reduce bulging and deformation from true circular section. This position on the dollies is particularly important in handling pipe of the lesser thicknesses. As a further aid in maintaining a true circular section, timber struts are wedged into both ends of the pipe, as illustrated.

No rotation or other handling of the pipe section is allowed until 24 hr. after the mortar coating has been applied. Immediately after being removed from the wrapping machine, the pipe is treated by the Hunt process as an aid to effective curing. The pipe section is then moved to its place in the curing row. Power-operated cables attached to the dollies move the pipe sections along the curing row. After the 24-hr. curing period the dollies are dispensed with, the sections being then rolled along a timber skidway. As soon as the dollies are freed, they are returned to the wrapping machine.

At the outer end of the curing row a crane picks up the pipe section and places it on a motor truck for delivery to the trench. A similar crane on a truck that moves along the trench lifts each section as it arrives and lowers it carefully to place. The asphalt coat, having been retouched on the way to the trench, is in perfect condition.

IN TRANSIT to trench motor trucks stop to permit workmen to touch up marks on asphalt coat made in handling.



MOTOR TRUCKS that deliver to trench have wide saddles for supporting pipe. White marks show where pipe rolled along skids after dollies were removed.

In the trench the circumferential joints between pipe sections are riveted and the 1-ft. length of exposed metal at each joint is covered by casting a collar around this portion sufficiently thick to insure at least ½ in. of mortar outside any part of the pipe. This operation is facilitated by the bell-hole excavated at each joint.

All work on the Hetch Hetchy aqueduct is being done under the direction of M. M. O'Shaughnessy. Contract for wrapping the steel pipe is held by the Cement Wrapped Pipe Co., Ltd., organized by W. A. Kraner, who devised and patented the wrapping machine. The Bodinson Mfg. Co., San Francisco, built the machine for the contractor.

The pipe is fabricated by the Western Pipe and Steel Co. Wrapped pipe is delivered from the wrapping yard to the trench by the R. C. Conyes Co. The force of the Cement Wrapped Pipe Co. at the plant includes W. F. Fosha, assistant designing engineer, C. J. Larsen, general superintendent, and S. C. Pierce, concrete technician. Pat Kernan is inspector for the San Francisco city engineer.

JOB ODDITIES

Unusual Features of Engineering and Construction

Photos, Halbran

LIGHT REMOVABLE ROOF *(above and at right)* of oxy-acetylene-welded aluminum is novel feature of new Waldorf-Astoria Hotel in New York. Covering over dance floor of roof garden is built in two sections mounted on motor-driven rollers running on track. During fair weather the room below may be uncovered, except for an ornamental grill across its top. In the event of rain the two roof sections are run back into the closed position in about one minute.

PARACHUTE TESTS *(below)* of low-altitude "leaps" by dummies are made from the 150-ft. high central arch span of the Colorado St. bridge in Pasadena, Calif. A drop from the level of the bridge roadway determines the quick-opening qualities of the parachutes.

©Acme

©Acme

SKYSCRAPER CHURCH in San Francisco combines space for religious and business activities. Tall steel-frame structure houses Temple Methodist Episcopal Church and also contains 500 rooms operated as a commercial hotel.

SOIL BEARING TESTS *and* HOIST LAYOUT *Feature Building Job*

SPECIAL tests of soil bearing values for the foundation piers and an efficient layout of equipment for erecting the building lend importance to the construction of the City National Bank building at Lansing, Mich., for which the Reniger Construction Co., of Lansing, is contractor. No adequate data on the bearing value of the hardpan foundation stratum being available, comprehensive tests were conducted to determine safe loading capacities.

As originally designed, the foundation was to consist of 450 friction piles. Condition of the two adjacent buildings, however, made it hazardous to risk the vibration and soil compaction occasioned by pile driving. The caisson design was selected as the most feasible under the circumstances.

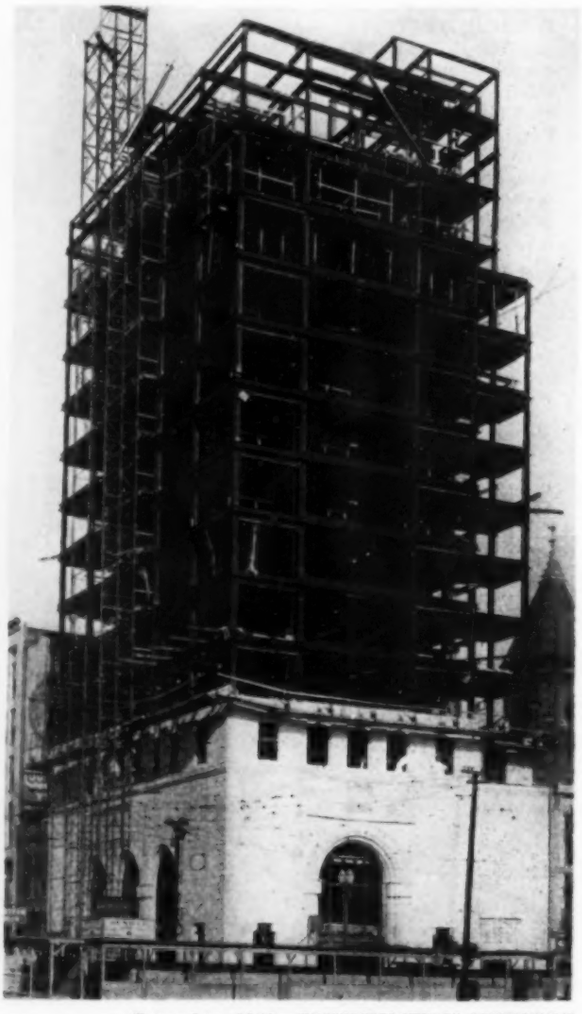
Test borings showed the ground strata to be uniform over the entire site. The top stratum, consisting of 15 ft. of waterbearing sand, was underlaid by 4 ft. to 5 ft. of hard gumbo clay resting on the hardpan. Prof. W. S. Housel of the University of Michigan made three tests on the hardpan, using loads up to 46 tons on a 1-sq.ft. bearing plate and loads up to 60 tons on bearing plates having areas of 2 sq.ft. and 4 sq.ft. The bearing plates were circular in shape, and the loads were built up in increments of 2 tons at 15-min. intervals, deflections being noted after each increase.

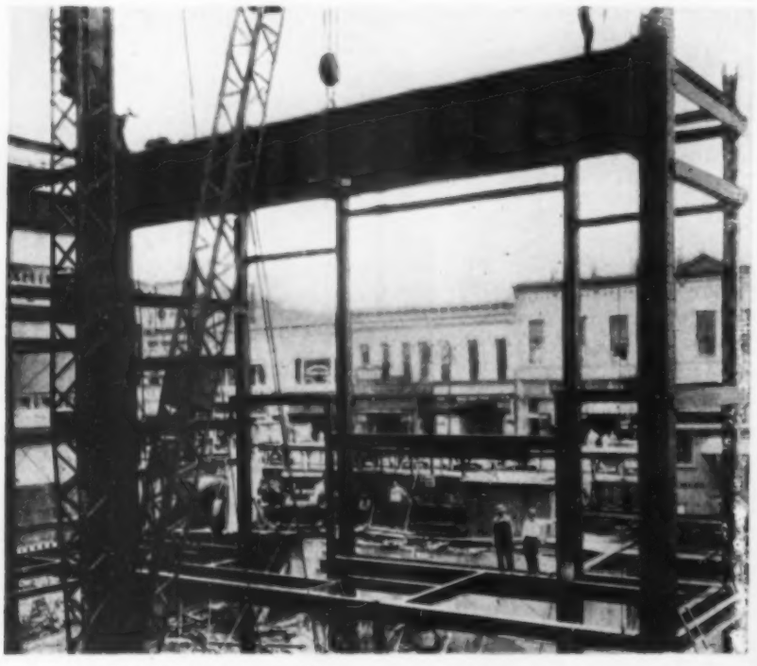
Results of the tests were plotted, and curves were drawn. From the graphs it was possible to recommend a loading of 26,000 lb. per square foot, with a safety factor of 2½. Lee Black and Kenneth C. Black, of Lansing, the architects, chose to use a unit loading of 20,000 lb., increasing the safety factor.

Excavation—A total of 31 caissons was required, extending from the level of general excavation, El. 121, to hardpan at El. 106. Prior to excavating for the foundations, the walls of the adjoining buildings had to be underpinned to a depth of 15 ft. In addition, a retaining wall was constructed to 22 ft. below general basement level to permit excavation of the elevator pit, 25x40 ft. in plan and 20 ft. deep. To drain the water-bearing sand for the excavation of this pit, a system of 25 well-points was installed to a depth of 2 ft. below the bottom of the proposed hole. A Novo plunger pump worked at full capacity uninterruptedly for 3 weeks handling the water from the 25 well-points and keeping the soil dry during the excavation of the pit and construction of the shaft walls.

Design of building—The building is a fifteen-story steel-frame structure on a corner plot fronting 88 ft. on Michigan Ave. and 67 ft. on Washington Ave. A two-story penthouse rises above the fifteenth floor. Height

FIFTEEN-STORY OFFICE BUILDING *(right)* **has 1,000-ton steel frame erected in 5 weeks. Romanesque exterior is built up of random ashlar limestone.**

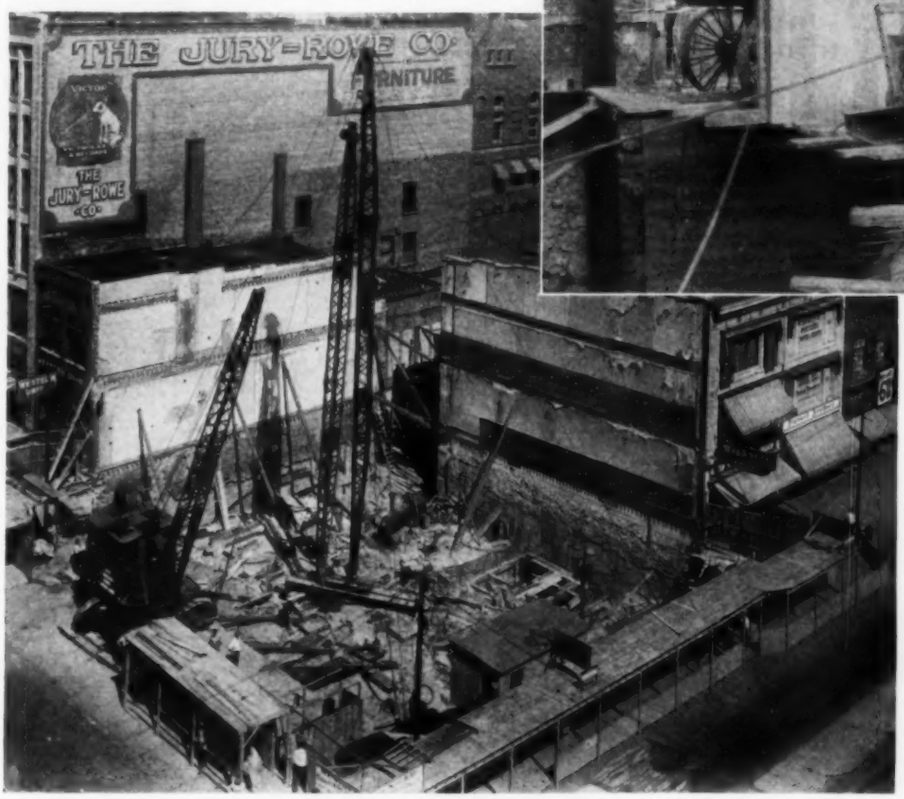




30-TON GIRDER, 50 ft. long, over banking room, is placed by seven-part line on steel guy derrick.

TWO-DRUM 85-HP. GASOLINE HOIST *(right)* operates steel erection derrick. After first few floors are set, hoist signals are given by telephone.

STEEL ERECTION DERRICK *(below)* with 90-ft. mast and 80-ft. boom is moved on to job intact and set up in area 88x67 ft.



of the fifteen-story portion is 187 ft. 4 in. The first floor, which houses the main banking room, is 37 ft. high; other floors are 10 ft. 10 in. in height.

All exterior walls are composed of random ashlar limestone in three tones and textures. The architectural treatment is Romanesque. Floors are of reinforced-concrete joist construction, with arches poured on removable B & R steel pans.

Steel Erection—One steel guy derrick, with a 90-ft. mast and 80-ft. boom, powered by a Novo 85-hp. two-drum hoist, erected 1,000 tons of Bethlehem steel shapes in the frame, the members of which were fabricated by the Jarvis Engineering Works and erected by the Jarvis-Flint Erection Co., both of Lansing. The close limits of the working area inclined the eight 1½-in. guys at an angle approaching the perpendicular and imposed a high stress on these cables. In erecting each of the four 50-ft. 30-ton girders over the banking room, the main guy (opposite the load) received a stress of 44 tons, and the two secondary guys, 27.5 tons each.

Columns were fabricated and set up in three-story lengths, those for the ground floor being 67 ft. long and the remainder, 33 ft. in length. The derrick, of course, was jumped three floors at a time, maintaining a position near the center of the building. Steel was delivered to the job as needed, no space for storage being available.

Hoist operation, after the steel for the first few floors had been set, was controlled by telephone. A telephone line ran from the erecting gang to the hoist operator, who was equipped with head phones and mouthpiece. The system greatly increased efficiency over that attained with the usual method of bell signals and eliminated the hazard of mistaken signals caused by objects striking the bell cord.

The hoist, located in a corner on the ground floor, operated 1,400 ft. of ¾-in. load line on the front drum and 1,100 ft. of ⅝-in. boom cable on the rear drum. Total fuel-and-oil cost for six weeks' operation was $58.90. This economy in operation was due largely to the anti-friction bearings, the hoist being equipped with roller bearings at the drum shaft, intermediate shaft and drums.

Two 110-cu.ft. Ingersoll-Rand compressors supplied air to four Chicago Pneumatic air hammers used by the four crews, each composed of four men, which drove a total of 24,764 rivets. The compressors moved up with the riveting gang. This procedure, using light compressors, eliminated long air lines, with consequent losses in pressure, kept the compressors out of the way of the building contractor, and reduced dismantling charges at completion of the steel job.

Material Handling—Hoists at two locations elevate builders' materials. A two-compartment tubular steel tower on one side of the building provides for a concrete bucket and a material elevator, both operated by a Novo 50-hp. two-drum electric hoist placed in one corner of the basement. A Knickerbocker 10-S mixer is located in the basement at the base of the tower. A second material platform hoist is strategically situated in a permanent elevator shaft on the side of the building opposite the tower. This elevator is powered by a Novo two-drum 40-hp. gasoline hoist. Driveways from the street provide ready access to the building by trucks for delivery of materials. A Chicago boom driven by a Novo 30-hp. hoist lifts stone for the walls.

Administration — For the Reniger Construction Co., A. M. Woods, superintendent, directs operations on the job. W. Anderson, vice-president and general manager, was in charge of steel erection for the Jarvis-Flint Erection Co. York & Sawyer, of New York City, acted as consulting architects to Lee Black and Kenneth C. Black, of Lansing. A. A. Ballantyne, of the Novo Engine Co., Lansing, supplied the accompanying photographs and data.

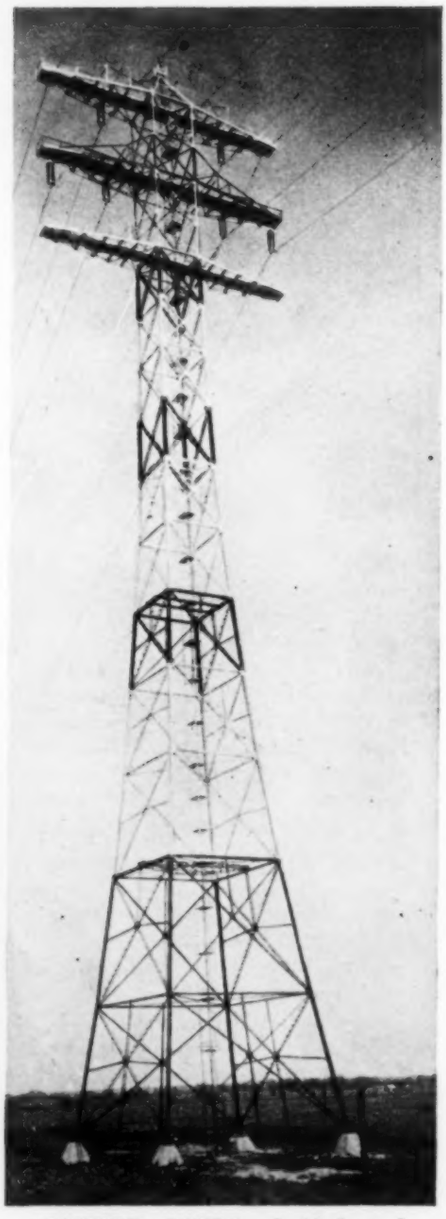
Transmission Line Crew *Strings 3,750-Ft. Span Between 425-Ft. Towers*

MAIN TOWERS of structural steel, each 425 ft. high, carry cables across Mississippi River on 3,750-ft. span.

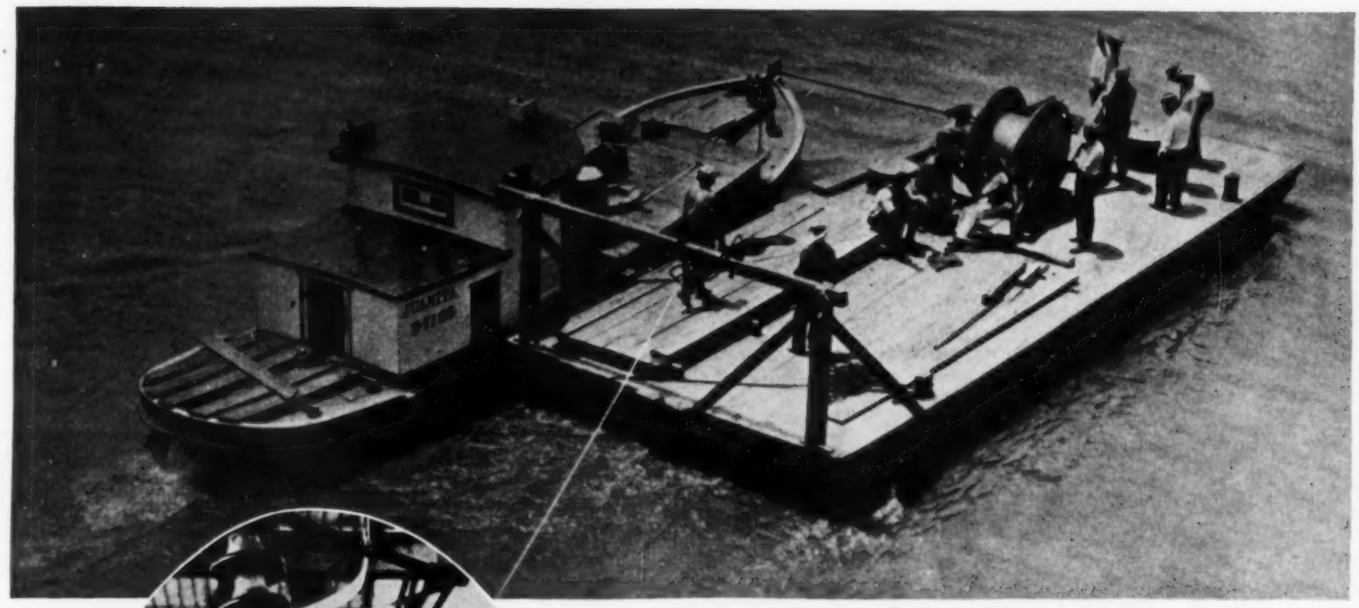
A TRANSMISSION line crossing the Mississippi River with main towers 425 ft. high and 3,750 ft. apart, designed and built by Stone & Webster Engineering Corporation, has recently been completed near Baton Rouge, La., for the Baton Rouge Electric Company.

The crossing has been constructed as a double circuit, 132,000-volt interconnection between the Baton Rouge Electric Co. and the Gulf States Utilities Co. lines for distribution of power from the Louisiana Steam Products, Inc., station, a subsidiary of the Engineers Public Service Co. which has just been completed at North Baton Rouge, La.

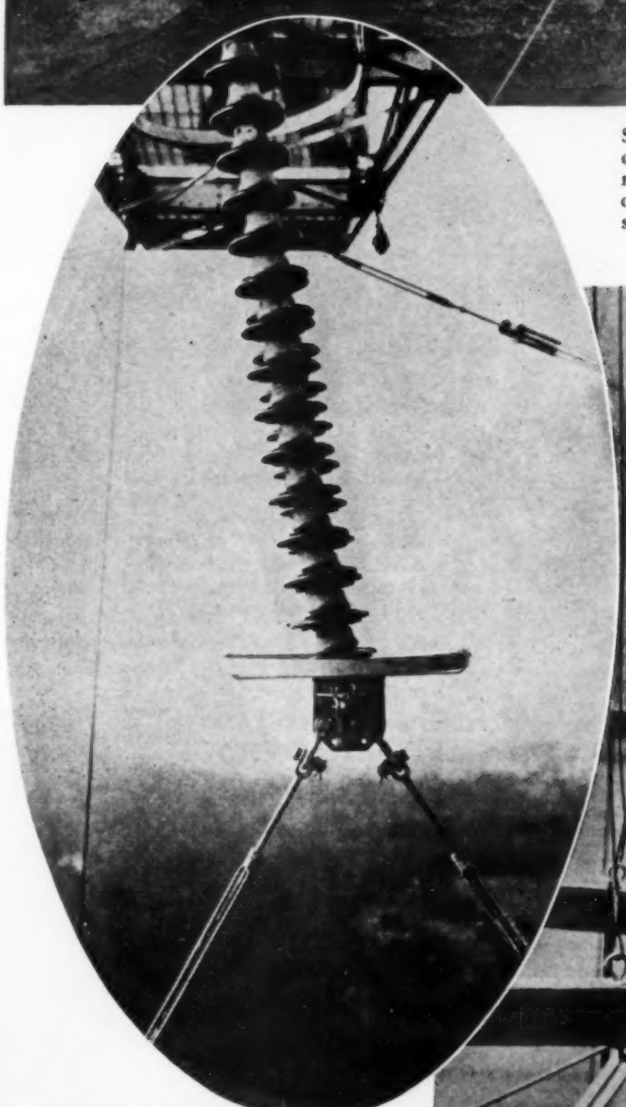
ANCHOR TOWER, 50 ft. high, is built 900 ft. back from main tower. Dead end insulator assembly is being pulled into place. Maximum stringing tension in all cables was 6,200 lb. Cables were pre-cut to accurate lengths. Final adjustments made by turnbuckles at main tower end of cables.



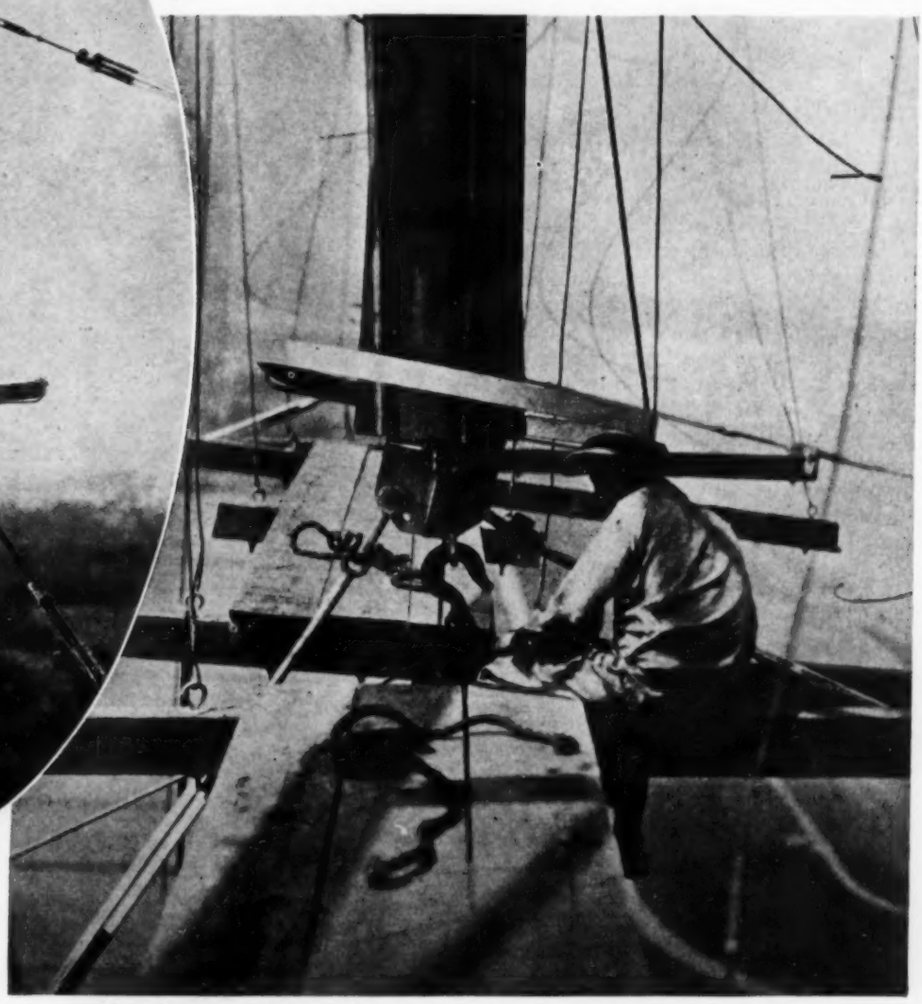
PAINTED BANDS of black and white increase tower visibility from airplanes. Note walkway platforms with railings above and below each cable, and rest platforms on ladder.



STRINGING cable across Mississippi River. Conductor, attached to cross-arm of tower on one side of the river, is paid off as barge, carrying reel, moves forward. Later, cable is pulled from streambed into place on opposite tower. Cables are 300,000 c.m., A.C.S.R., with ultimate strength of 23,400 lb.; they were cut to length in manufacturer's shop.



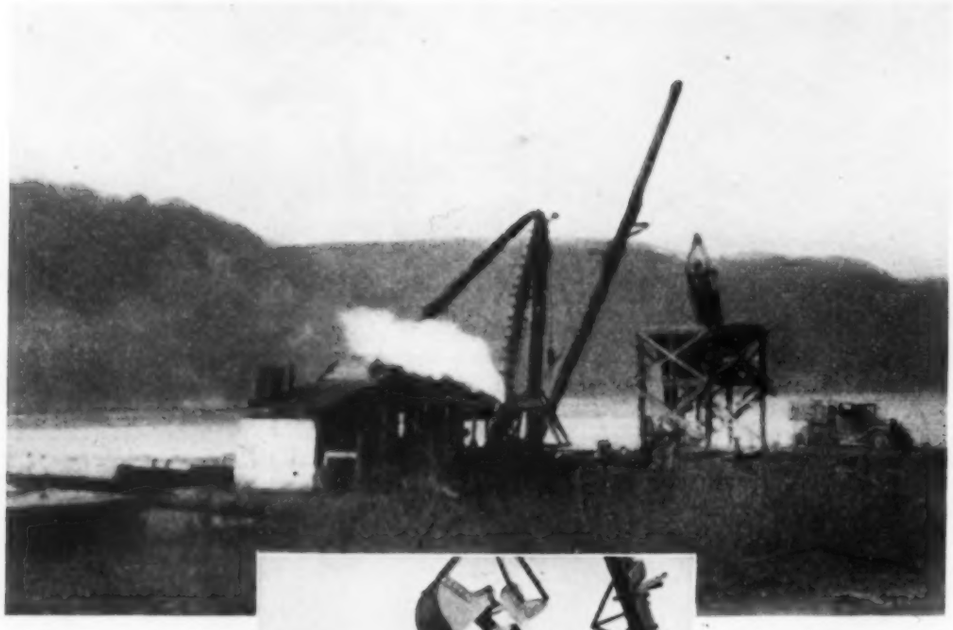
INSULATOR ASSEMBLY for a conductor cable in place on tower cross-arm with cable attached, but not strung. At end of cross-arm ground wire cable is in final position. Insulator assembly combines advantages of dead end and suspension support, the cable being dead-ended to double strings of high strength insulators.



AFTER TRANSFER OF CABLE to opposite river bank, clamps, parallel reinforcing cables and turnbuckles were secured to end of cable and steel hoisting rope was attached. Tractor pulling on cable hoisted it to tower top.

Contractors

Dredge Aggregate and Truck Cement *for Kentucky Paving Job*



SAND AND GRAVEL are delivered in barges to wharf and are unloaded by stiff-leg derrick into hoppers over truck runway. TRUCK *(left)* receives load of dredged aggregate from hoppers over runway on wharf.

AVAILABILITY of river sand and gravel and lack of railroad facilities induced Gorrell, Barrow & Kirkpatrick, of Russelville, Ky., to enter into a subcontract with the Smiley Sand & Gravel Co., Atlanta, Ga., to supply dredged aggregates for the last 20 miles of a 29-mile paving job on the River Road, between Prospect and Bedford, Ky. The subcontractor excavated material from the bottom of the Ohio River with two suction dredges and delivered washed sand and gravel by barge to a wharf on the river bank, 4 miles from the job. To save rehandling of cement from the railroad to the batching plant, Gorrell, Barrow & Kirkpatrick hauled cement by truck from the mill, a distance of 50 miles.

Description of Project—Numerous grades and curves were included in the 29-mile project, which traverses rolling country. The slab was 20 ft. wide, with a 9-6½-9-in. cross-section. A crimped steel plate was installed on the center line, with 4-ft. dowel bars spaced 12 ft. apart. No expansion joints were used.

Grading had been completed before Gorrell, Barrow & Kirkpatrick began operations on June 28, 1930. Paving was continued until Nov. 17. In 111 working days in the period from June

TRUCK AND TRAILER deliver load of 350 sacks to cement shed. Platform on level with vehicle bodies is also used to dump cement sacks on to batch trucks.

28 to Nov. 17, the contractors laid 23 miles of slab. The remaining 6 miles was built this year. On one day of 14 hr. 45 min., the 1930 Koehring 27-E paver poured 1,640 ft., mixing 700 1-yd. batches, including 2 per cent overrun. This record required an output of 47.46 batches an hour.

Materials Supply—At the Bedford end of the job, 9 miles was built by hauling materials from the railroad. For the remaining 20 miles, the Smiley Sand & Gravel Co. dredged and delivered to the wharf at Westport approximately 92,000 tons of aggregates.

a Carr formgrader. The job was equipped with 5,000 lin.ft. of Blaw-Knox steel forms to enable the form setters to keep 1,000 ft. ahead of the mixer.

Finishing and Curing—Behind the finishing machine, the contractors used a longitudinal plow-handle float and a belt, in addition to the usual long-handled floats and straight-edges. Burlap was spread on the fresh concrete and was kept wet through the day's run and, on the last 300 ft., for 1 hr. after the placing of the last batch.

Direction—Under H. D. Palmore, chief engineer, and G. L. Logan, engineer of construction, M. D. Ross, district engineer, and C. J. Frain, resident engineer, directed construction for the state highway department. L. D. Gorrell, member of the firm, managed the job for the contractors.

TRUCKS of one-, two- and three-batch capacity haul average distance of 6 miles to mixer.

C. J. FRAIN *(left, above)*, resident engineer, and L. D. GORRELL, of Gorrell, Barrow & Kirkpatrick.

LONGITUDINAL FLOAT rubs off bumps in soft concrete. Belt and long-handled floats follow.

Both of the subcontractor's suction dredges were driven by gasoline motors. A 10-in. dredge was powered with a 150-hp. Wisconsin motor, and an 8-in. dredge was equipped with a 100-hp. Waukesha. At Westport, a floating wood stiff-leg derrick operated by a 35-hp. steam hoist engine unloaded the sand and gravel from barges with a 1-yd. clamshell bucket and deposited the aggregates in bins over a truck driveway.

Light hired trucks hauled the sand and gravel 4 miles up steep grades from the wharf to the stock piles at the batching plant. A Koehring 1-yd. gasoline crane fed Blaw-Knox 75-ton steel bins which charged Blaw-Knox weight batchers.

Cement handling—Two Mack trucks and trailers, hauling day and night from the mill at Speed, Ind., 50 miles away, kept the job supplied with sacked cement. Each truck-and-trailer unit carried 350 sacks. The trucks and trailers unloaded on to a platform, running the length of the cement shed, at approximately the height of the vehicle bodies. Sacks of cement, six to each 1-yd. batch, were dumped from hand trucks on this platform on to the aggregates in the batch trucks. The haul to the mixer averaged 6 miles.

Fine Grade—Preliminary shaping of the subgrade was performed by a Caterpillar 60-hp. tractor with an Adams 12-ft. blade grader. A Caterpillar 15-hp. motor grader and a Buffalo-Springfield 5-ton gasoline roller put the finishing touches on the fine grade. Form trenches were cut by

BATCH TRUCK is loaded from weighing hoppers under steel bins. Truck in background is preparing to dump load of aggregate hauled 4 miles from wharf.

Getting Down to DETAILS

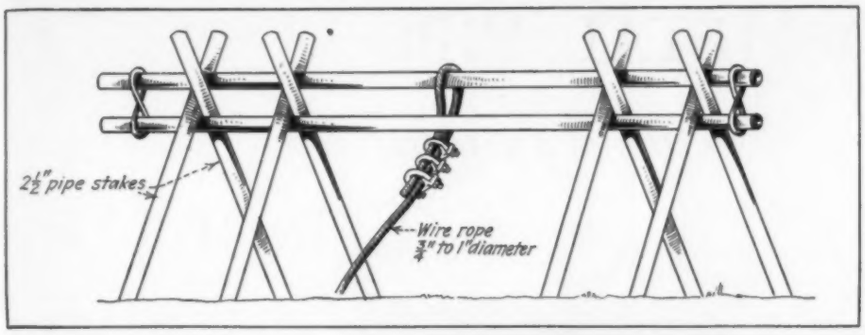
SPECIAL CABLE-WRAPPING MACHINE *(left)*, built by Elevator Supplies Co., of Hoboken, N. J., in accordance with design suggested by John A. Roebling's Sons Co., cable contractor on the George Washington bridge, holds 2,000 lb. of wrapping wire, sufficient for 40 ft. of 36-in. diameter cable, and has two wrapping speeds, 2 r.p.m. for starting and 50 r.p.m. for normal operation. Two 15-hp. electric motors maintain 300-lb. wire tension. By reversing operation, machine removes any defective wrapping at same speeds, rewinding wire on spools. Six machines wrapped 3,277 lin.ft. of cable in 5 days of 10 hr. each. Best record of any one machine was 183½ ft. in 8-hr. day.

TO PLUMB COLUMNS *(left)* E. W. Moehle, steel inspector on Mutual Home Building, Dayton, Ohio, for Schenck & Williams, architects, invented an adjustable clamp, made of slotted flat piece of steel and two angle pieces. Device can be fitted over web or flange of column or over full width of flange of horizontal beam. Narrow slots in horizontal arm of clamp permit insertion at various points of piano wire wound on hand reel and carrying 22-lb. bob.

Close-up Shots of Job Methods and Equipment

PREPARING SUBGRADE *(above)* for 11-mile section of concrete highway between San Juan and Salinas, Calif. Peninsula Paving Co., San Francisco, uses Caterpillar "30" tractor to operate, in tandem, Lakewood-Carr form-grader and Clausen grade cleaner.

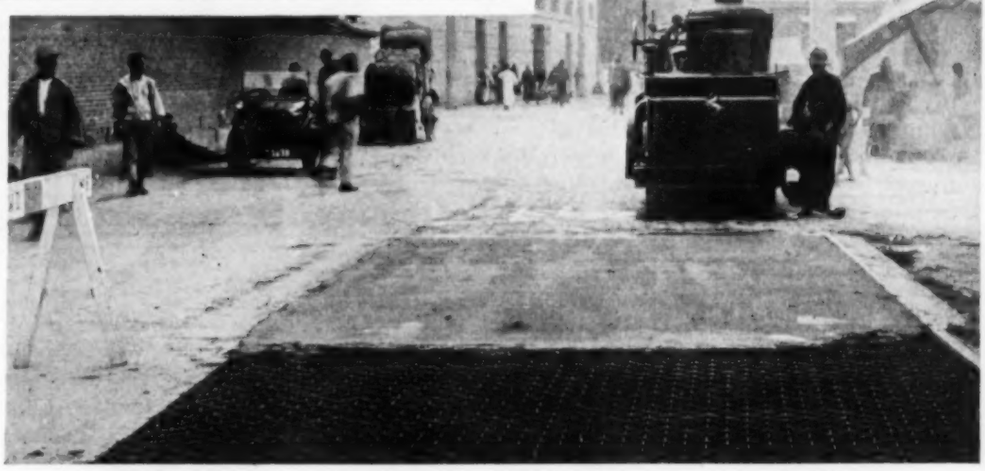
WHITE BRICK *(left)* laid along center line of red brick pavement near Circleville, Ohio, serve as traffic guide. White brick, spaced 3 ft. apart, eliminate maintenance of painted center line.



SAW HORSE DEADFALL *(above)* aids in skidding heavy machinery parts over sandy ground with block and tackle at mine in Chile. Stakes are of 2½-in. pipe either drawn out to a point and sharpened by a blacksmith or fitted at one end with a sharpened hardwood plug. Stakes are driven and deadfall set quickly. Parts may be dismantled and used repeatedly.—*Sketch from* J. J. ALDEN, *master mechanic, Los Angeles.*

On your own job aren't there a few interesting details of method or equipment, ingenious "kinks," that should be illustrated in these pages?

Mail your pictures to the Editor. Payment for those found acceptable for publication.



ARMORED ASPHALT on river front road of British Concession of Tientsin, China, carries heavy traffic, including unsprung, steel-tired native cargo carts, which cause excessive wear on ordinary concrete and asphaltic roads. Pavement consists of 6-in. reinforced concrete foundation, 2-in. asphaltic base and 1-in. asphalt top course. Reinforcement shown is Surfastal 6-in. steel mesh, a London product.—*Photo from* C. N. JOYNER, *deputy municipal engineer, Public Works Department, British Municipal Council, Tientsin, China.*

CRANE HOIST on front end of tractor transports sections of precast concrete pipe and lowers them to place in ditch. When not handling pipe, the tractor, equipped with bulldozer blade, is used for moving earth.

HOIST ON TRUCK MIXER *(right)* raises discharge opening of drum 8 ft. above ground. New Heil device on Rex moto-mixers increases spouting range on street and sidewalk paving and building foundation work.

CORRUGATED METAL PIPE *Forms Economical* SERVICE TUNNEL

CORRUGATED metal pipe, 66 in. in diameter, installed by the workmen of the Security Benefit Association, forms an economical and durable tunnel 1,010 ft. long for the utility lines serving new buildings on the Association's estate 5 miles west of Topeka, Kan. The new conduit connects with an existing concrete tunnel. Considerations of strength, flexibility, cost of installation and expected service life led the owner's engineers to specify Armco corrugated iron pipe.

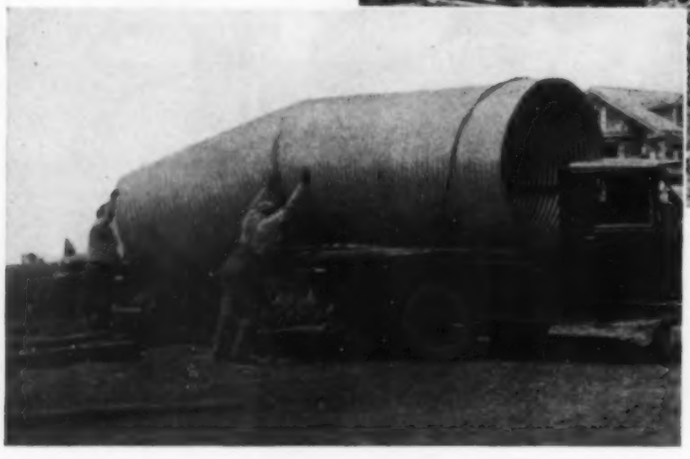
A floor of $\frac{3}{16}$-in. steel plates, 42x60 in. in size, was laid on 2x2x$\frac{3}{16}$-in. angle irons 6 in. above the invert of the pipe, covering a 5-in. water line. Brackets made of steel angles were electrically welded to the sides of the pipe at 10-ft. intervals in the shop of the Road Supply & Metal Co. to carry an 8-in. steam pipe and 4-in. return (both insulated) and cables for telephone and light wires. Rectangular manholes also were shop-welded to every tenth section of the corrugated metal pipe, in 20-ft. lengths, selected for the conduit by the engineers.

For a distance of 600 ft. the pipe was laid on a grade of 2.73 per cent; the grade for the remainder of the tunnel was 0.44 per cent. One bend of approximately 60 deg. was required in the conduit. It had originally been intended to make the bend with three 20-deg. elbows; but this plan was altered to make the bend on a longer radius, using only one 20-deg. elbow.

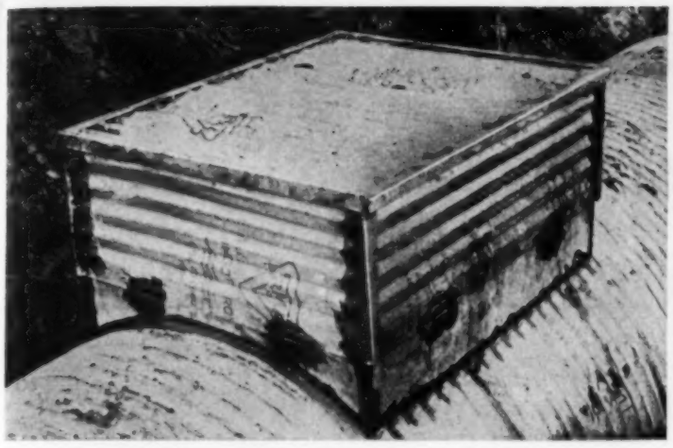
Excavation—Depth of trench ranged from 4 ft. 9 in. to 8 ft. 6 in., with an average depth of 6 ft., requiring total excavation of 2,700 yd. A small crawler dragline dug the trench. At one end of the tunnel, the excavating crew encountered an outcrop of rock.

DRAGLINE excavates trench to average depth of 6 ft. for 66-in. corrugated metal conduit.

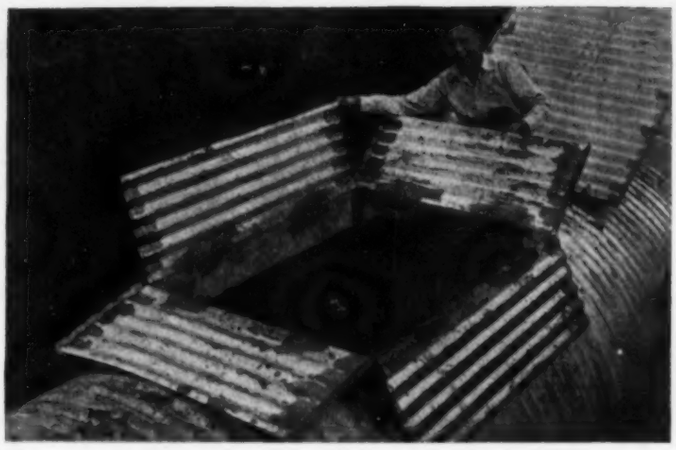
INSTALLING LAST SECTIONS of tunnel. In background is bend in which 20-deg. elbow was used.



20 - DEG. ELBOW (left) for metal service tunnel is unloaded from truck.



MANHOLES, welded on pipe at plant of Road Supply & Metal Co., are installed in conduit every 200 ft.

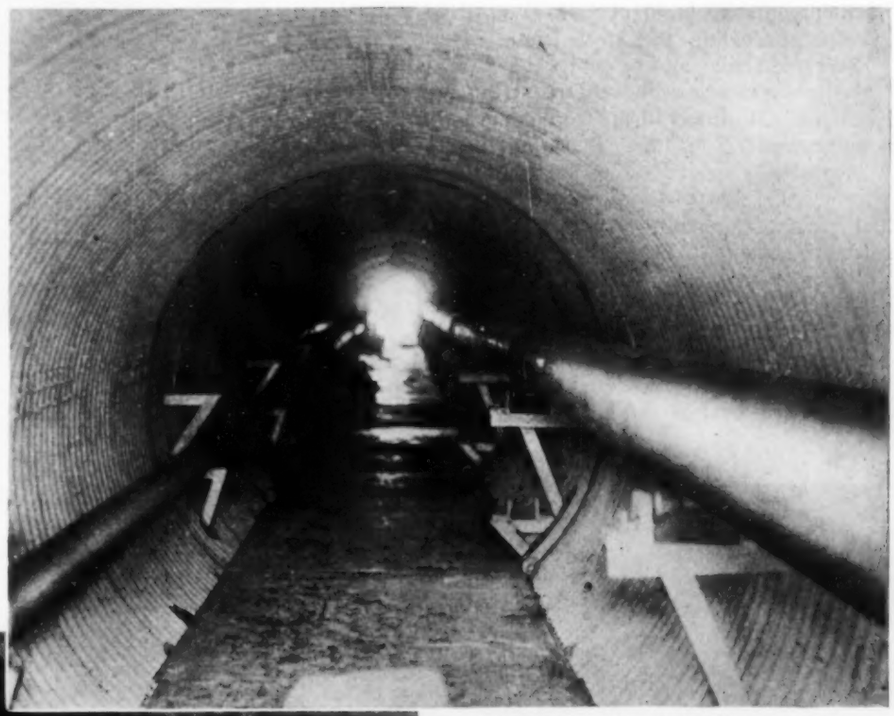


MANHOLE IS OPENED by removing cover and turning back hinged sides.

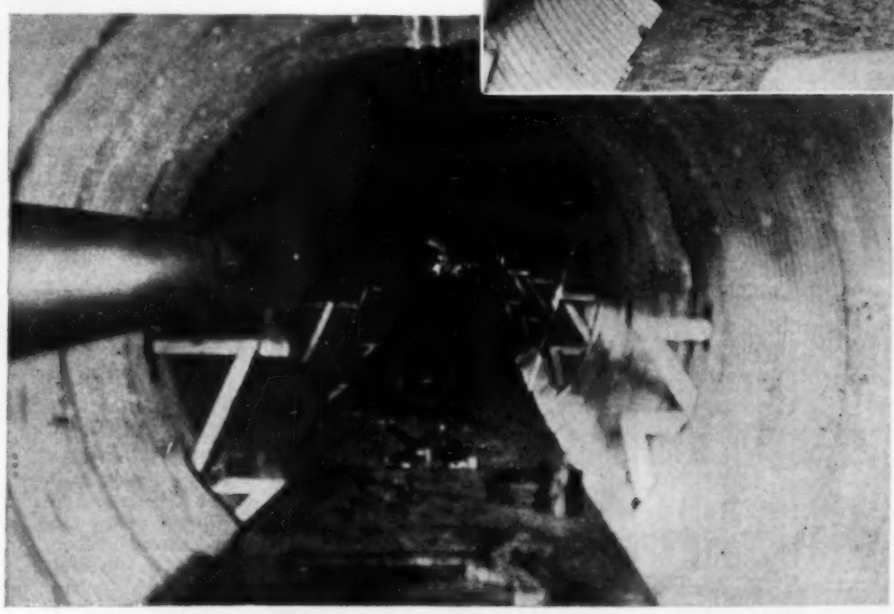
It was necessary to cut through 2 ft. of hard shale in the bottom of the trench. In spite of the extra time required to remove this rock, the excavation was performed at an average cost of 27.6c. a yard.

Installing Pipe—Installation of the pipe followed closely behind the excavating crew. Joints between the 20-ft. pipe sections were connected with 12-in. galvanized bands which fitted over the corrugations of both pipe ends. Each band had three bolt lugs that assured strong, positive connection. As fast as the sections of conduit were placed, a crew of men under DeForest Joslin, superintendent and engineer in charge of the property, installed the 8-in. steam line and 4-in. return.

It was found that a crew of four men could install 160 ft. of conduit in the trench during an 8-hr. day at a total labor cost of 12.5c. per foot.



INTERIOR OF TUNNEL. Steam pipe and return line are supported on brackets. Steel-plate floor covers water main.



INTERIOR AT ELBOW. Angle-iron brackets 10 ft. apart for service lines were welded to pipe in shop.

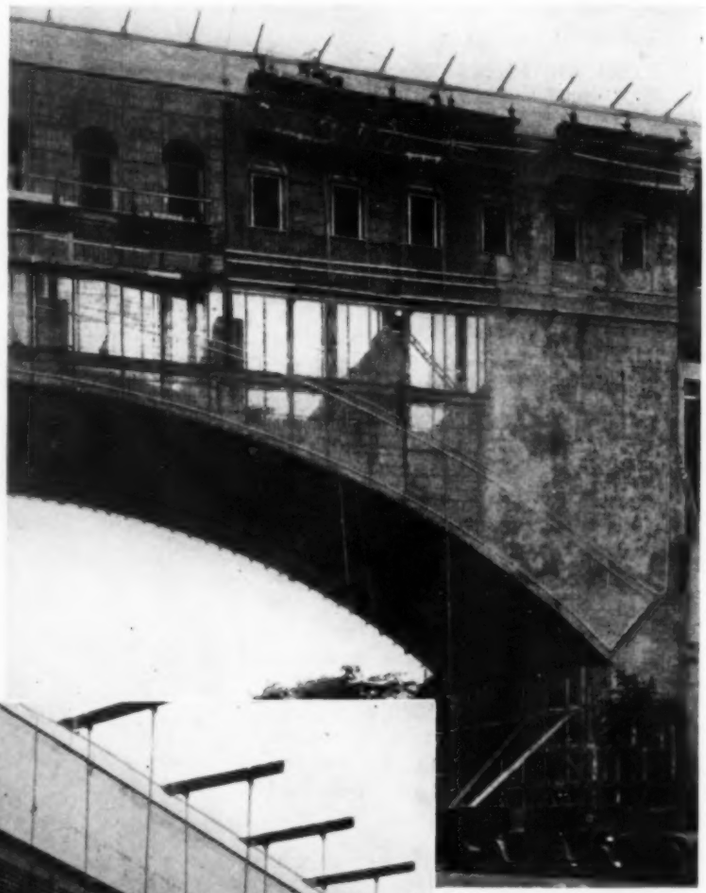
This low cost resulted in a total saving of approximately $2,000 over the estimate for a rigid structure of this same size.

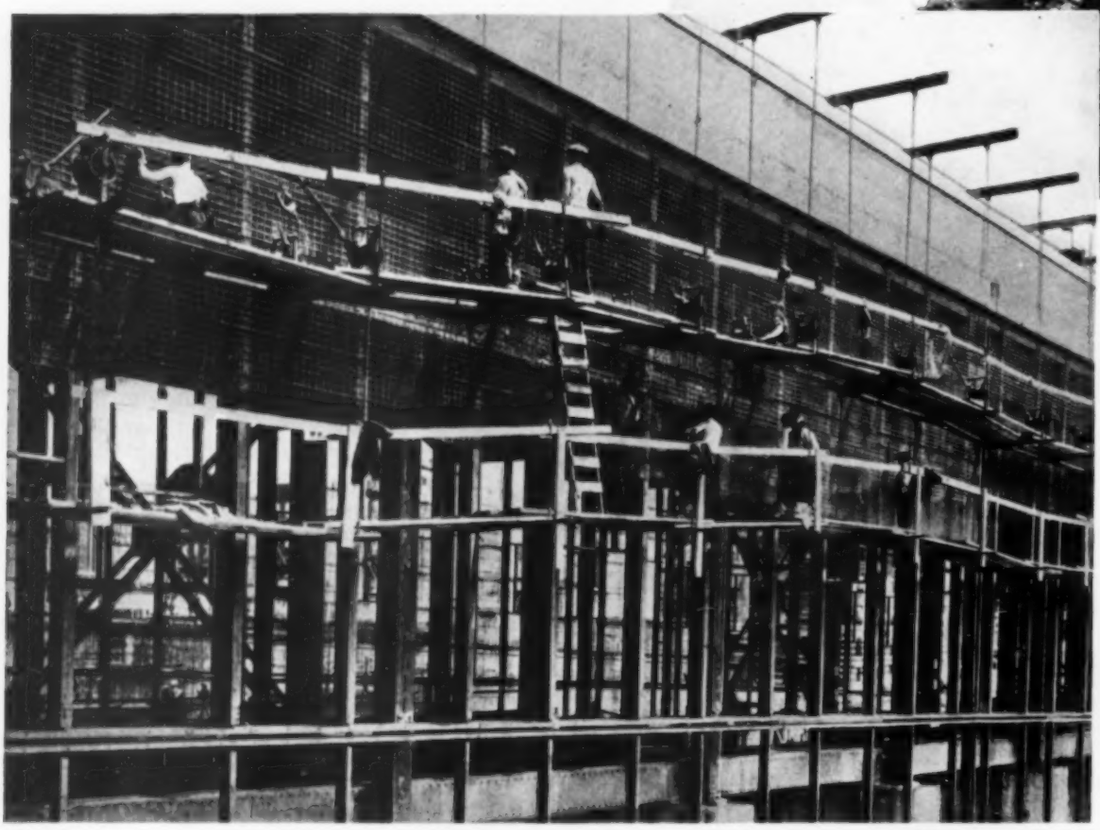
Two 20-ft. pipe sections at a time were trucked from the loading dock to the job, where two men unloaded the pipe. A tripod equipped with a chain hoist lowered the pipe into the trench.

The new conduit was put into service about July 15, 1931. Design and construction of the tunnel were under the direction of J. M. Kirkpatrick, national president of the Security Benefit Association.

GUNITE CURTAIN WALLS *Built Against* WIRE SCREEN BACKING

EFFECTIVE architectural treatment of the surfaces of the New York City approach to the George Washington suspension bridge across the Hudson River was economically attained by the application of Gunite on a wire mesh and fine screen backing. The Arthur J. White Co., of Pittsburgh, subcontractor on the work for the Cornell Contracting Corp., of New York, general contractor, used four cement guns to build up 54,000 sq.ft. of 2-in. curtain walls, concealing the steel frame of an arch across Riverside Drive, and to apply 11,000 sq.ft. of ½-in. coat to the surfaces of the abutments in approximately 3 months. No wood forms were employed in the curtain-wall construction, the surfacing being shot against Screenback Steeltex, a product of the National Steel Fabric Co., consisting of 3x4-in. electrically welded 10-gage wire mesh to which was attached by threaded wire a layer of fine screen cloth containing twelve spaces to the inch. For reinforcement of the Gunite, ¼-in. bars on 18-in. centers were placed against this backing, and a layer of 3x4-in. welded 9- and 7-gage wire mesh was fastened to the bars. After the outside surface had been completed, a thin coat was applied to the back to cover the fine screen.

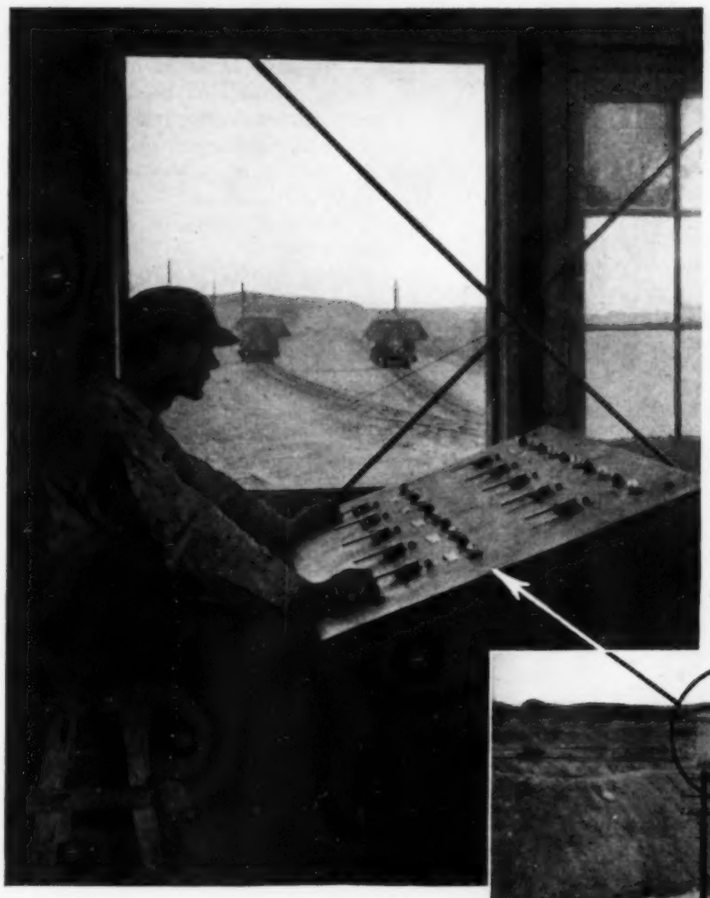




CURTAIN WALLS of arch across Riverside Drive are built up by four cement-gun machines which shoot Gunite against fine screen cloth attached to welded wire mesh.

REINFORCEMENT (left) for curtain wall consists of ¼-in. bars on 18-in. centers, placed in front of screen backing. To bars is fastened additional reinforcement of welded wire mesh.

Dispatchers Operate Electric Railway by REMOTE CONTROL



CONTROL DESK in dispatcher's house has switch for each of ten sections of track. Switches control car movement in both directions.

RIDERLESS DUMP CARS are equipped with induction motors and solenoid brakes fed from two power rails between track rails. Track is divided into ten sections, insulated from one another, to facilitate simultaneous handling of several cars.

A REMOTE-CONTROL electric railway system on which individual, riderless, motor-driven larries are governed by switches in dispatchers' stations transports excavated limestone rock over a mile from the pit to the crusher at the Dallas, Tex., plant of the Trinity Portland Cement Co. Two operators, located where they can view the loading, unloading and movement of the larries, control the principal car movements.

Each larry, or dump car, is equipped with two 50-hp. squirrel-cage motors and electric solenoid brakes. Three-phase power for the induction motors and brakes is collected from dual extra rails laid between the two track rails. The track rails and the power rails are divided into ten sections which are insulated from one another. On the control desks in front of the operators are switches which govern the delivery of energy to each section.

By energizing all sections, a car runs from one end of the track to the other. If only one section is energized, the car runs through this section to the next section, where, the power supply being cut off, the brakes automatically set and stop the car. By momentarily applying energy to a section, cars can be "inched" along to desired position. It is possible to change the direction of travel merely by throwing a switch.

Use of a.c. power and induction motors for such a railway system is new, d.c. motors usually being employed for installations of this type. Power is supplied through a 2,300/220-v. distribution system, transformers and control cabinets for full-voltage starting being located along the track. The railway system was devised and equipped by the General Electric Co., which had previously applied the scheme to another installation of different type. The squirrel-cage motors and solenoid brakes are mounted on Atlas Car & Mfg. Co. larries.

Power is conserved by the use of squirrel-cage motors. It is a characteristic of these motors that they maintain almost constant speed under all conditions. On down grades, the motors do not overspeed but, instead, act as generators, feeding electricity back into the power system to help drive other cars on the railway.

Each of the two dispatchers' stations has a control desk equipped with a control switch and two indicating lights for each section of track.

Reservoir Lining Chuted from TRAVELING TRUSS

A TRAVELING truss 48 ft. long, mounted on wheels and carrying an inclined chute, as illustrated herewith, enabled Elliott, Stroud Bros. & Seabrook, contractors, of Seattle, to deliver concrete for lining the sloping sides of a new reservoir at West Seattle, Wash. The basin is 915 ft. long, 570 ft. wide at one end, 745 ft. at the other, and 22 ft. deep. The sides, 48 ft. long on a 1 on 2 slope, are lined with 7-in. concrete slabs 21 ft. 7 in. wide between joints. The floor lining also is 7 in. thick.

From a mixer on the reservoir bank, concrete was discharged into a hopper feeding the chute on the traveling truss. At its upper and lower ends the truss was mounted on a pair of wheels, so that it could be moved laterally after each slab of the side slope lining was concreted. The chute, built up of short sections pivoted to the sides of the truss, could be opened up at various points in its length to deliver concrete to the desired place on the slope. After the concrete had been deposited, it was screeded roughly to a thickness of 5 in. by a sliding platform which rode on the side forms and was hauled up the slope by a Beebe all-steel hand hoist. The traveling truss was then moved on to the next slab and the remaining 2 in. of the 7-in. lining was completed by dumping mortar from the top of the slope and finishing smoothly from a second sliding platform, raised gradually by another Beebe winch.

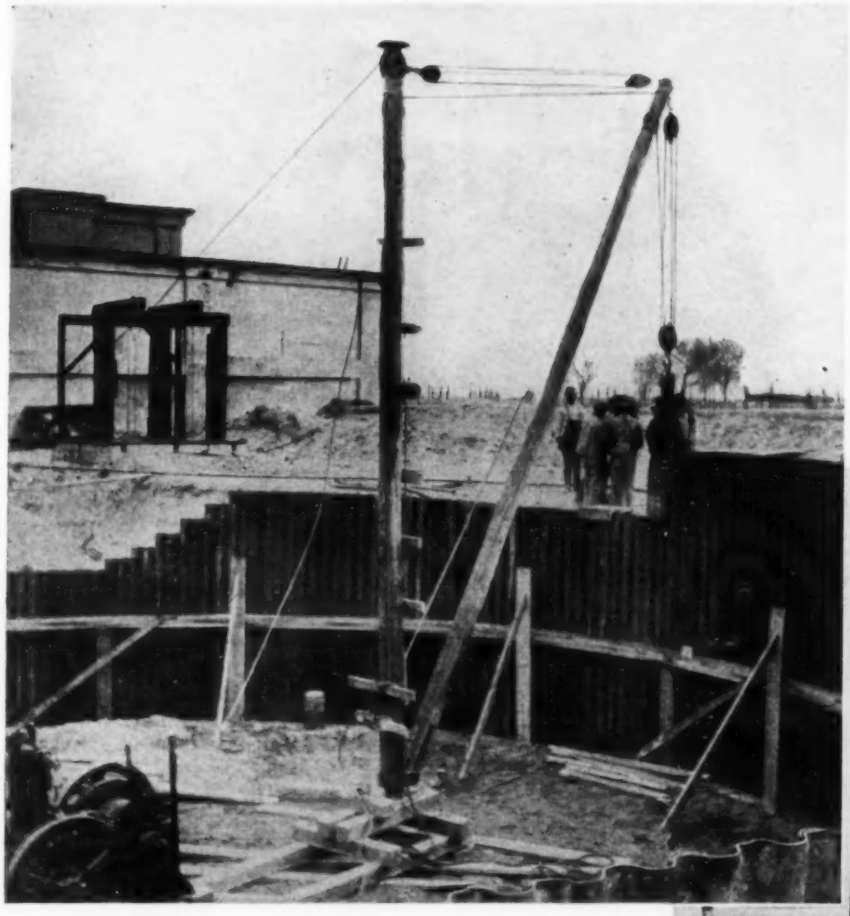
Concrete trucks delivered the mortar, which ran down the slope to the face of the platform. After the mortar had been distributed roughly by shoveling, a finisher troweled the surface as the platform gradually moved up the slope.

The construction of the reservoir was under the supervision of T. H. Carver, assistant city engineer of Seattle.

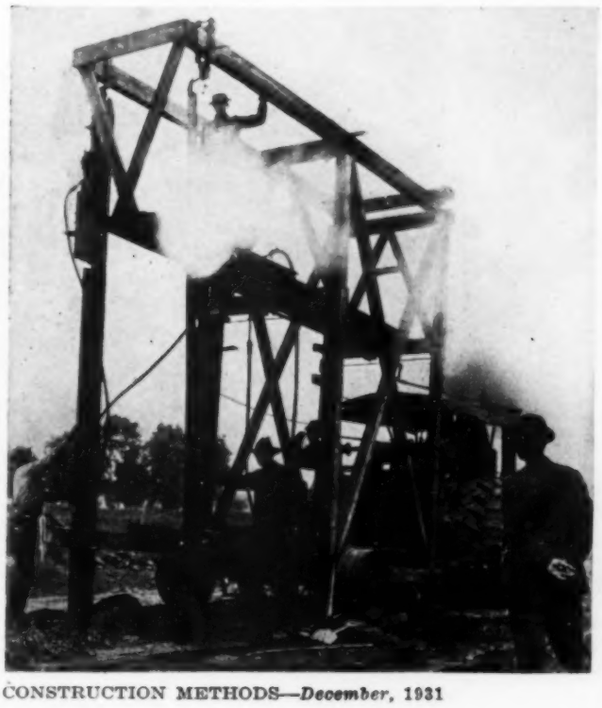
FROM OPENING IN INCLINED CHUTE on wheel-mounted traveling truss, concrete is deposited on side slope of reservoir and brought to uniform thickness by screeding platform riding on forms and raised gradually by hand hoist at top of bank. **HOPPER** ***(upper picture)*** at top end of truss feeds concrete into inclined chute.

PILE DRIVING *Kinks*

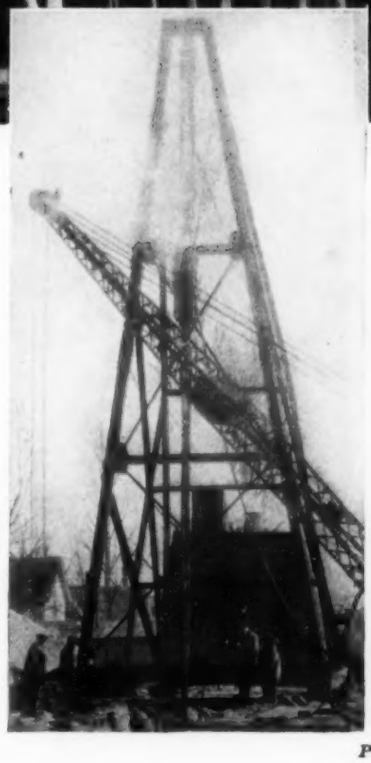
THE accompanying photographs illustrate details of methods and equipment devised by Wemlinger, Inc., of New York City, for driving and pulling steel sheet piling on three different jobs, one in New Mexico and the other two in Indiana.



PIVOTED MAST *(at left and below)*, with boom, carries hammer to drive steel sheet piling for circular cofferdam at Albuquerque, N. M. Sheet piling was set up around entire excavation and then each length was driven down 2 or 3 ft., the hammer working around the circle continuously. Movable wood platform aids operator.



PORTABLE DRIVING RIG *(left)*, mounted on tractor wheels and pulled by a road roller, was designed to put down sheeting simultaneously on two sides of a trench at Vincennes, Ind. Wooden frame carried platform for operators and each McKiernan-Terry hammer, hung from overhead trolleys, worked independently.



FOR PULLING SHEETING *(right)* 40 ft. long at South Bend, Ind. This structural steel four-legged A-frame proved effective. The rig moved on rails, with hoisting engine carried on platform. An inverted hammer extracted 60 to 80 piles daily.

BEFORE USING NEW DRILL, operator removes plugs and caps installed by manufacturer to close inlet and exhaust ports against accidental introduction of dirt.

LUBRICATION is of fundamental importance. Drill runner fills oil chamber before starting machine and every 2 hr. afterward.

BEFORE CONNECTING TO DRILL, hose should be blown out to free it of trash which might stick valve or hammer in starting drill.

CORRECT PRACTICES

Assure Satisfactory

ROCK DRILL SERVICE

HIGH drilling speed, freedom from delays for repairs, and long life are the rewards of proper maintenance and operation of rock drills. Most important of all the factors entering into satisfactory drill service is lubrication.

Most hand-held rock drills have one or more oil chambers, closed with filler plugs. These oil pockets should be filled before starting the drill and every 2 hr. afterward. Not all operators know that a well-lubricated drill will cut half again as much as one that is moderately dry. Lack of oil causes the "scuffing" of the piston surface which often leads to breakage by "progressive fracture." If scuffs ever are

2-FT. DRILL STEEL is proper length to use in starting a hole, even in soft rock. Longer steels mean lost time.

STEEL TOO LONG in this drill. Operator is holding drill properly. In softest rock, use of long drill steel is not so objectionable.

MOVE COMPRESSOR NEARER TO DRILLS! Steels are too long, and men are working in strained position because of pull on hose.

WRONG POSITION! This method binds drill steel in chuck and causes excessive wear of chuck.

BLOWING HOLE OFTEN results in faster cutting of deep holes. In shallow holes, operational blowing of machine ordinarily is sufficient.

SIMPLE CLEANING OPERATION consists of pouring gasoline into air inlet, turning on air for few seconds, and then giving drill good shot of oil. Never use kerosene.

discovered, it is essential that they be removed before running the drill again.

Upon receiving a new drill, the operator should fill the oil pocket with a good grade of light lubricant, remove all plugs from the inlet and exhaust ports, and blow out the air hose before connecting it. A shot of oil in the inlet before connecting is of some value.

In starting a hole, no matter how soft the rock, the runner ought to use 2-ft. drill steel. Time is lost in trying to use 4-ft. or 6-ft. steel at the start. To operate at maximum speed, the drill must be held by the handles. Other methods cause slower progress and perhaps trouble. A man can break off the throttle by using it to press down on the drill or pull up the steel. Faster cutting results from blowing the hole often. Nuts must be kept tight, particularly on the side rods, to avoid excessive wear. Frequent cleaning is necessary; a simple method is by flushing the drill mechanism with gasoline.

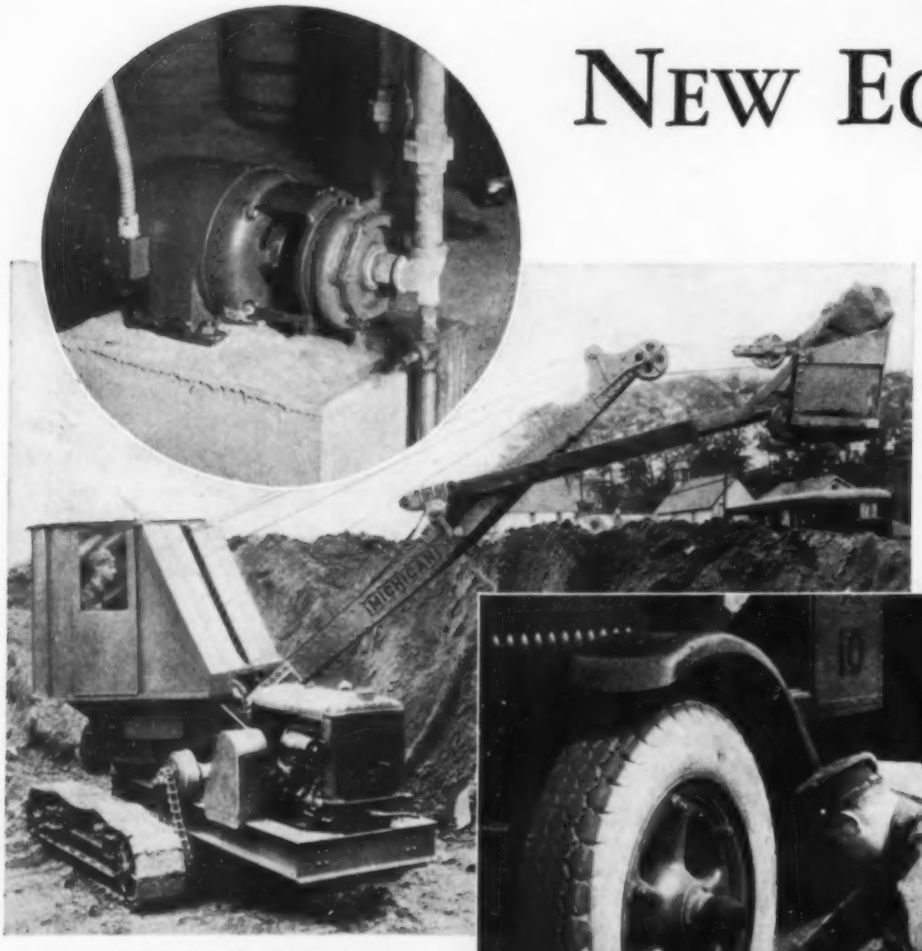
Numerous suggestions for correct operation and maintenance of rock drills have been collected from drill runners and compiled for general dissemination by the Cleveland Rock Drill Co., which supplied the accompanying photographs to illustrate both correct and incorrect practices.

VALVE RELIEF PORTS sometimes become clogged. Drill will not run with ports closed. They are easily cleaned with wire.

SIDE RODS particularly must be kept tight. Loose rods cause early wear and loss of air. When side rod springs are used, they should be kept in adjustment.

TO CLEAR HOLE IN DRILL STEEL of impacted cuttings, operator runs drill on its head. If used in time, this method is effective.

NEW EQUIPMENT



CENTRIFUGAL PUMP *(in circle, left)* of Monobloc unit is bolted to extended motor frame. Bronze impeller, with integral shaft sleeve, is mounted on continuous shaft of Masterbilt ball-bearing electric motor. Units are equipped with ½- to 5-hp. motors for pumping from 55 (or less) g.p.m. against 15-ft. head to 150 g.p.m. against 80-ft. or 65 g.p.m. against 115-ft. head.—Worthington Pump & Machinery Co., 2 Park Ave., New York City.

NEWLY DESIGNED CAB, insuring complete enclosure and clear vision for operator, is feature of this late model shovel. Sides and front of cab may be removed, if desired. — Michigan Power Shovel Co., Benton Harbor, Mich.

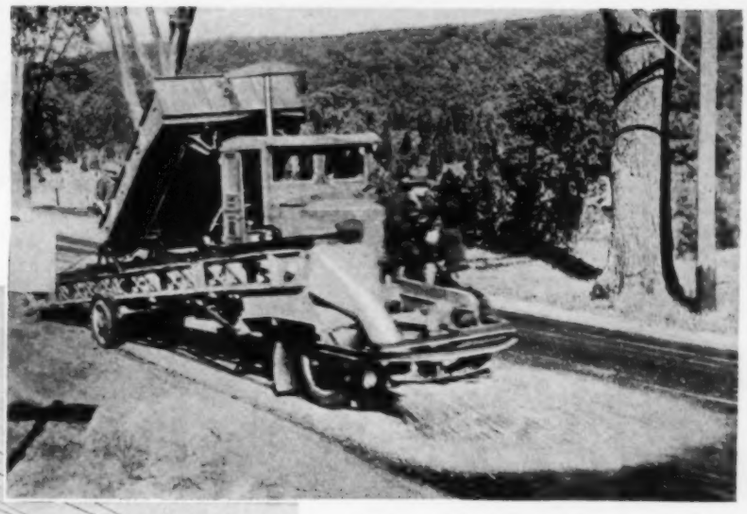
LOADOMETER *(left)*, made of aluminum alloy, weighs loaded trucks, trailers, buses and tractors. Two cams support platform until wheel comes to rest, thus preserving accuracy of weighing mechanism. Inclined ramps accommodate largest size tires. Furnished in load capacities from 7,000 lb. to 7 long tons. — Black & Decker Mfg. Co., Towson, Md.

©Wide World

BORING MACHINE *(left)* installs 4- to 30-in. pipe under railroads, streets and highways. Boring machine, in ditch, is operated by chain and sprocket drive from gasoline motor on bank. Pipe is bolted to rotating hollow sleeve which is forced forward by two jacks. Cutter head is welded to forward end of pipe. Earth is removed through sleeve.—Young Engine Corp., Canton, Ohio.

CUSHIONED FLOORING *(right)*, of tongue-and-groove construction, consists of outer layers of tempered Presdwood and an inner layer of Quartrboard, the latter serving as shock absorber and sound deadener. In three sizes, 6-, 9- and 12-in. squares. Border strips furnished.—Masonite Corp., 111 W. Washington St., Chicago, Ill.

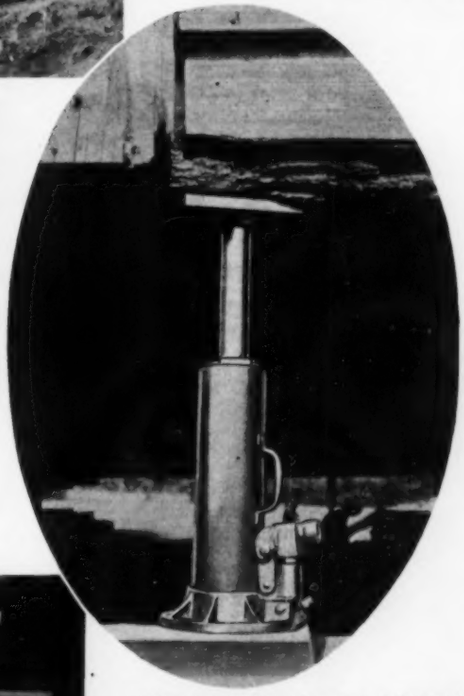
on the Job



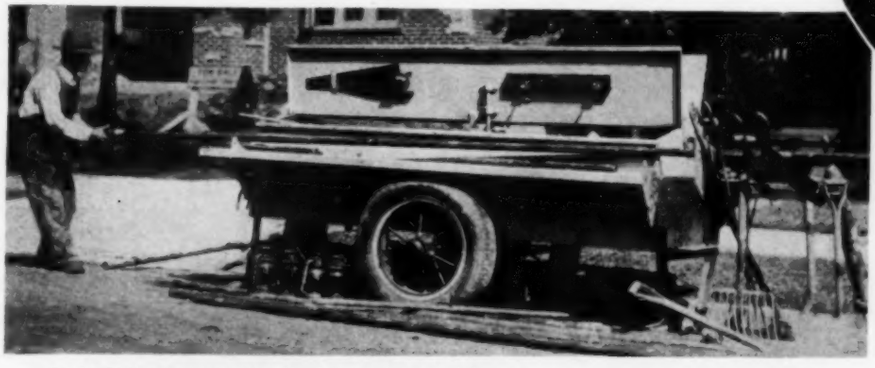
CRAWLER SHOVEL - CRANE - DRAGLINE - TRENCH HOE *(right)* of 1¼- to 2-yd. capacity provided with gasoline, diesel or electric drive. Shovel equipped with 25-ft. boom, 17-ft. 6-in. dipper stick and 1¼-yd. dipper. Crane capacity, 32 tons at 12-ft. radius and 10,400 lb. at 45-ft. radius on 45-ft. boom. — Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

SAND SPREADER with independent power unit distributes sand or gravel, dry or wet, from any standard dump truck. Truck, quickly attached by coupling pin, provides motive power. Material, discharged at rear end of truck, is delivered by belt conveyor to selective-speed circular distributor at forward end, under constant control of operator. Deposits heavy cover 8 to 12 ft. wide and sands any width up to 30 ft. Can handle up to 60 tons an hour.—Universal Road Machinery Corp., Kingston, N. Y.

MOTOR-DRIVEN HIGHWAY MOWER for cutting weeds from shoulders, slopes and ditches. Consists of power-driven sickle with cutter bar attached to steel frame which carries motor, all mounted on pneumatic-tired wheels in tandem. Can be attached to any make of truck by means of universal coupling and telescoping pipe. Two men are required, driver and operator.—Toro Manufacturing Co., Minneapolis, Minn.



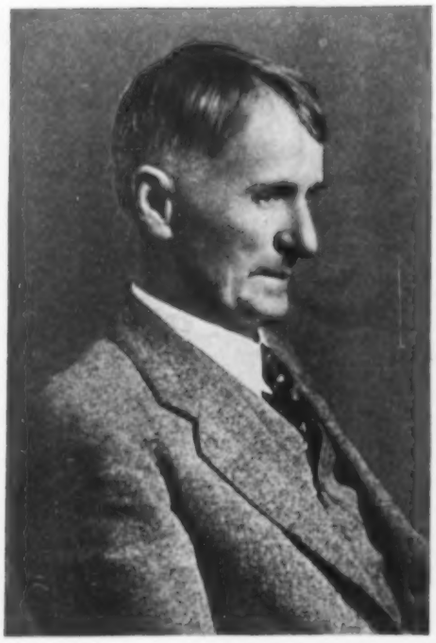
EXTRA HEAVY-DUTY HYDRAULIC JACKS having unified control of both power and speed pumps, thus eliminating handle shifting and increasing raising speed. Both pumps are operated simultaneously from single socket, the speed pump cutting out automatically as soon as load is reached. Operated by one man, assuring positive control in lifting or lowering even capacity loads. Other features: (1) Bi-power safety — every jack designed to withstand twice its rated capacity, and (2) Leak-proof housing—elimination of all sweating or seepage of oil. Twenty-three models, 1½ to 30 tons. — Hein-Werner Corp., 1209 National Ave., Waukesha, Wis.



LIGHT-WEIGHT, ALL-STEEL TOOL BOX with arrangement of compartments and shelves for storage of tools and equipment. Double covers lock simultaneously. Front and rear stiff-legs fasten into position from inside. Both wheels lock to box. Timken bearing equipped. Trailing speed 40-45 miles an hour. Lantern guards. "HanDeeBox" made in two sizes: 8 ft. long, with 35 compartments; 6 ft. long, with 25.—Littleford Bros., 443 East Pearl St., Cincinnati, Ohio.

Present and Accounted For —

A Page of Personalities



SIMS ELY has been appointed city manager of Boulder City, Nev., the municipality being built under federal government supervision to serve the personnel on the Hoover dam. Mr. Ely has held responsible municipal positions in Arizona and has taken part in drafting legislation affecting the Colorado River waters.

JAMES W. FOLLIN, formerly secretary and business manager of the Philadelphia Building Chapter, Associated Pennsylvania Constructors, has been named engineer of the Philadelphia Federation of the Construction Industry.

CHARLES L. WILSON is the newly appointed state highway engineer of Oklahoma, succeeding A. R. Losh, who resigned to become city manager of Oklahoma City. Mr. Wilson has been with the department a number of years and was serving as division engineer prior to his promotion.

Receive Awards for Long-Time Municipal Service

AT ITS recent annual convention in Pittsburgh, the American Society of Municipal Engineers presented to three of its members the Greeley Awards for long-time service by engineers in municipal work.

J. H. DINGLE *(left)* starting as a surveyor and now city engineer of Charleston, S. C., has served that city 38 years.

ROBERT HOFFMAN *(center)* entered the service of Cleveland, Ohio, in 1893 as rodman and during a period of 38 years became commissioner, chief engineer and consulting engineer, Department of Public Works.

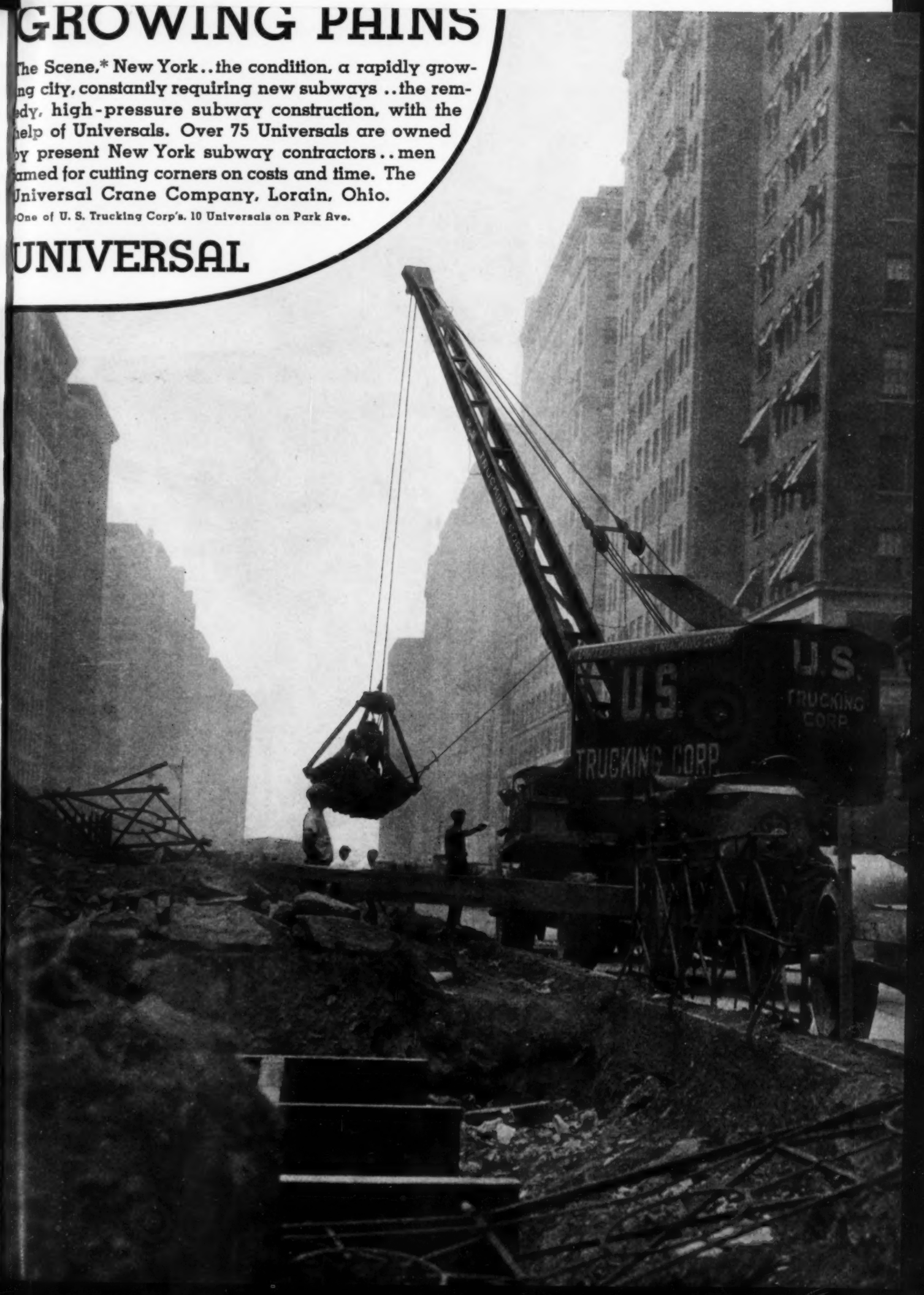
ELLIS L. DUTTON *(right)*, now assistant city engineer of Minneapolis, started his engineering work with that municipality as levelman 47 years ago.

GROWING PAINS

The Scene,* New York..the condition, a rapidly growing city, constantly requiring new subways ..the remedy, high-pressure subway construction, with the help of Universals. Over 75 Universals are owned by present New York subway contractors..men famed for cutting corners on costs and time. The Universal Crane Company, Lorain, Ohio.

*One of U. S. Trucking Corp's. 10 Universals on Park Ave.

UNIVERSAL



GOLD!

THE Gately Motor Co. of Alma, Colorado, uses a "Caterpillar" Sixty Snow Special to haul gold ore 8 miles to the railroad, altitude 12,000 feet—steepest grade 35%—average load fifteen tons twice a day! "Caterpillar" Tractors conquer high drifts, high hills, high costs!

Caterpillar Tractor Co.

PEORIA, ILLINOIS, U. S. A.

Track-type Tractors Combines Road Machinery

(There's a "Caterpillar" Dealer Near You)

Prices—f. o. b. Peoria, Illinois

TEN	$1100	TWENTY	$1900
FIFTEEN	$1450	THIRTY	$2375
SIXTY	$4175		

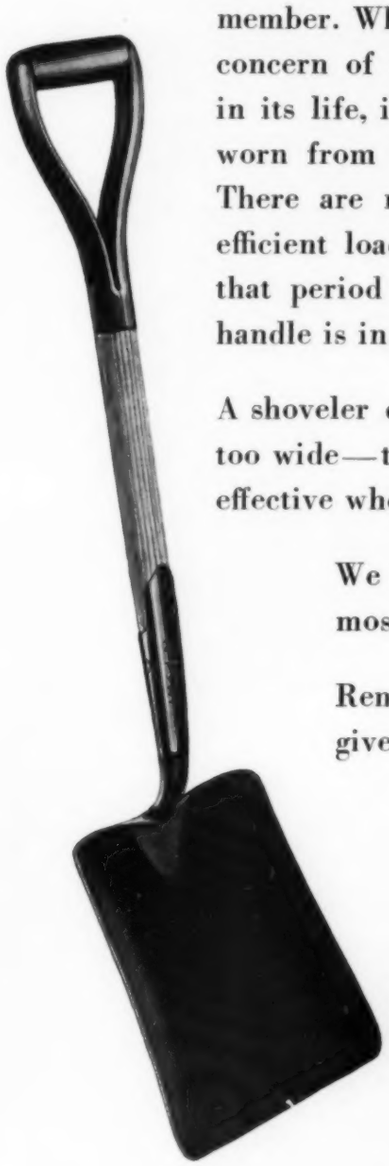
CATERPILLAR

REG. U. S. PAT. OFF.

T R A C T O R

There Are Two Business Ends to a Shovel

LOOK to the handle top and the blade edge—both must be good. A good blade end and a mediocre handle, or the other way around, a good handle and a blade edge that gives way, make the good features null and void. The two business ends must be good *in combination.*



The first inch of the blade—the "edge inch" is the most important member. When that is gone, every stroke is a loss. One ably managed concern of our acquaintance, that never bought a bottle of red ink in its life, insists that all its shovels be destroyed when one inch is worn from the blade. No attempted salvage by use in easy jobs. There are no easy jobs for poor shovels. When shovels lose their efficient load size or digging keenness, *out they go.* And to stretch that period of full size to the utmost usefulness, they see that the handle is in keeping.

A shoveler can't shovel at his best if the handle top is too narrow—too wide—too thin or liable to crack or sliver. Neither can he be effective when the blade is short or turned over or half-mooned.

We have seen many shovel specifications in our day, but the most intelligent are those that call for two good ends.

Remember, we understand what you need and are ready to give it to you.

A BW

WYOMING RED EDGE SHOVELS AND PICKS

Manufactured and Warranted BY OLIVER AMES AND SONS. NORTH EASTON, Mass. U.S.A.

BALDWIN'S MONONGAH FEATHERWEIGHT BALDWIN TOOL WORKS PARKERSBURG, W. VA. U.S.A.

PONY

Shovels—the Burden Bearers of this Revival

OUR Exhibit at the Road Show at Detroit will be in Booth 255 and we will endeavor to arrange an exhibit that will be especially interesting and instructive to visiting contractors and contractors' supply men.

Because, make no mistake about it, 1932 is going to be an important shovel year.

It's an ill wind that blows nobody good! The circumstances that make it necessary to strengthen the foothold on reviving business by giving employment to as many men as possible quickly, means that shovels will be the burden bearers of this revival.

So, contractors must brush up on Shovelology. Whims and fancies that were based on ease without efficiency or merely selling pretexts will no longer suffice.

Shovel makers, too, will have to be on their toes. We have ready Genuine O-Ames, Red Edge, Monongah, Pony and Knox-All to satisfy the need for longevity, full size, true edge blade, sturdy handle and that easy swing that comes from perfect balance.

Good dealers everywhere carry A B W Shovels. Look for the mark

A BW

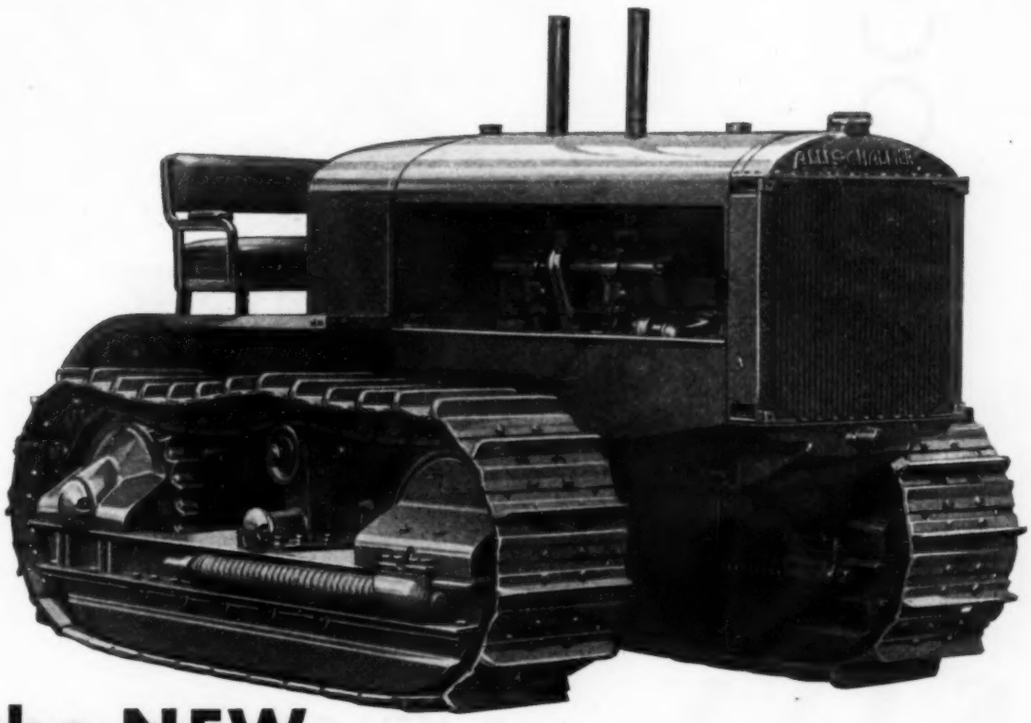
AMES · BALDWIN · WYOMING SHOVEL CO.

NORTH EASTON, MASS.

Operating Plants in

ALTON, ILLINOIS ANDERSON, INDIANA MONTPELIER, INDIANA NORTH EASTON, MASS.
PARKERSBURG, W. VA. PITTSBURGH, PENNA. WYOMING, PENNA.

6 SPEEDS - 6 CYLINDERS



in the NEW HEAVY DUTY FAST MODEL "L" TRACTOR

Think what it means on a dirt-moving job — in many cases three round trips from load to dump while other tractors make two — hauling more — moving more dirt on each single trip.

When you realize that Allis-Chalmers Model "L" Tractors have been in the toughest kind of service well over 4,000 hours — with practically no repair expense—you know they are built to last.

Consider these Model "L" features—high road clearance, unit construction — no frame or subframes, easy accessibility to all working parts, valve in head engine and replaceable cylinder liners.

It's a knockout! Allis-Chalmers Dealers are ready to show you—

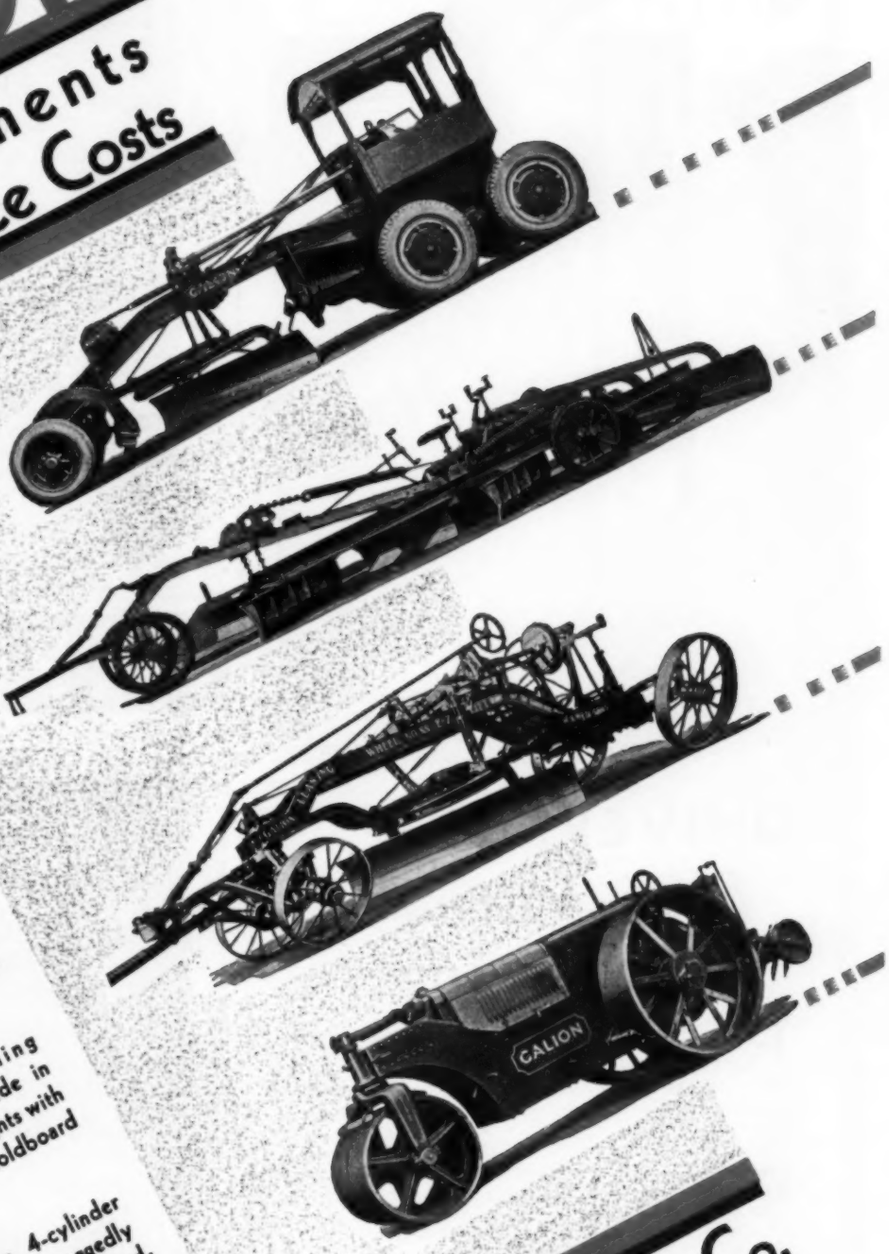
Allis-Chalmers

MILWAUKEE, U. S. A.

TRACTOR POWER FOR EVERY PURPOSE

GALION

Developments that Reduce Costs



Galion E-Z Lift Motor Patrol Graders with Double Drive, providing four-wheel traction with full flexibility.

Galion Mixing and Leveling Drag—especially designed for mulch or retread work. Accomplishes a thorough mixing of material and levels it ready for rolling.

Galion E-Z Lift Leaning Wheel Graders—made in various sizes and weights with a wide range of moldboard widths.

Galion Master 4-cylinder Motor Rollers—ruggedly constructed and well braced. Has abundant power. 10 and 12-ton sizes.

Full details on request

The Galion Iron Works & Mfg. Co.

GALION . . . . . OHIO

DISTRIBUTORS EVERYWHERE

SUCCESSFUL PERFORMANCE BOTH A.G.C. & A.

An Aid to Winter CONCRETING

The wind is howling outside. Tarpaulins have been pulled around the sides of the building where the concrete work is going on. The temperature is flirting with the freezing zone . . . not a very propitious time for concrete form work.

Here again the use of Calcium Chloride in the mix is a great advantage. It accelerates the set and develops full strength concrete more quickly, thus helping to minimize the danger of freezing.

It is noteworthy, too, that Calcium Chloride more thoroughly hydrates the mix thus producing stronger concrete throughout the whole mass. This is an advantage in upright concrete form work where it is difficult, by ordinary means, to keep the inner mass sufficiently moist to effect a complete cure.

Since contractors and builders have become familiar with these principles, the value in using Calcium Chloride in concrete form work has been widely recognized. Complete data on this timely subject will be gladly furnished you free of cost. Just send the handy coupon.

Calcium Chloride Publicity Committee

Mail the coupon to any one of these companies

Solvay Sales Corporation, 61 Broadway, N. Y. C.
The Dow Chemical Company, Midland, Michigan
The Columbia Alkali Corporation, Barberton, O.

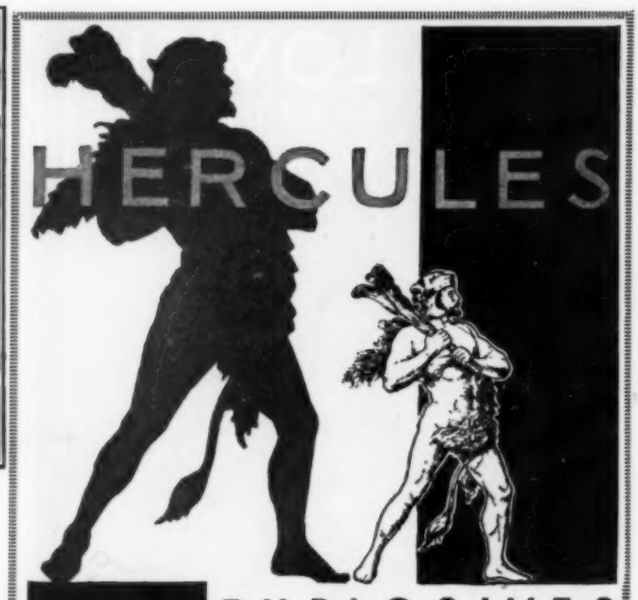
Without obligation please send complete data on the use of Calcium Chloride in concrete form work.

Name _____

Address _____

_____

CM 12-31



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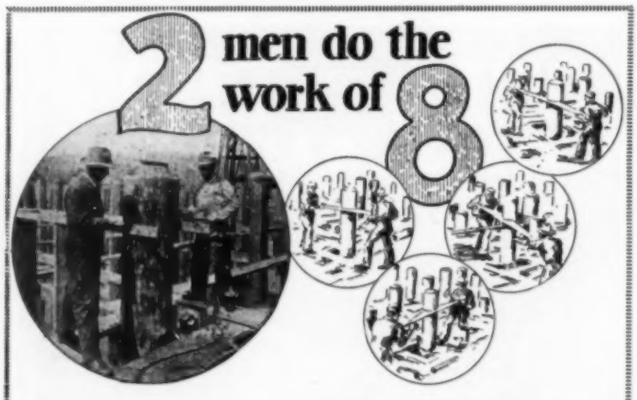
925 King Street · Wilmington, Delaware



—this faster way of cutting heavy timber

These dock builders will tell you what they think of Timber Wolf Portable Sawing Machines. Approximately 4,000 timber piles were cut on the dock shown. Two men with the Timber Wolf Saw averaged twenty-five 16 in. to 23 in. old growth yellow fir piles per day—4 to 5 times as many as two men with a hand-saw! Two men doing the work of 8 means profits to you. Write for other interesting Timber Wolf figures.

A.C. or D.C. Drive, or Compressed Air drive for underwater service.

REED-PRENTICE CORPORATION, Worcester, Mass.
Agents in Principal Cities
Detroit Office: 6-246 General Motors Building
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Practical facts on every phase of building construction!

• • • •

HERE is a set of books that is packed to the covers with plans and methods for speeding up production, saving materials and labor, and cutting costs. The six books cover every phase of practical construction work from estimating building costs to the selling of construction service—from plan reading and quantity surveying to practical job management. With these books, the contractor and construction superintendent can make costs come down and profits go up!

The Dingman Building Contractors' Library

Six Practical Volumes, 1149 Pages, Pocket Size, Fully Illustrated

The Dingman books have won a wide reputation among builders and building contractors for their sound, practical and easy-to-understand discussion of building construction work. All of the material has been drawn from actual practice.

This library is intended for

[1] The building contractor who wants a handy reference set that will give him almost instantly a ready answer to most of the problems that come up in the course of the day's work.

[2] The young men in the building industry who intend to make the business of construction their life work, and who want the kind of guidance that will aid them to climb to the top.

Practical data is given on analyzing a construction job into its component parts—estimating the costs of labor, haulage, equipment, materials, etc.—plan reading and determining quantities from specifications — personnel management — successful supervision of every building operation—efficient and economical business methods—office procedure such as accounting, banking purchasing, etc.—advertising and selling methods for contracting service—and a complete data book of tables, forms and calculations most frequently used by the builder.

Free Examination—Small monthly payments

Without a cent of expense—without any obligation on your part—you may examine the Dingman Building Contractors' Library for 10 days and determine its value for yourself. Try the books out on your everyday problems—make them prove their worth to you. Unless they meet every test send them back at our expense. If the books prove satisfactory and you decide to keep them, pay only $1.50 in ten days and then $2.00 a month for six months or $13.50 in all.

This coupon saves you $1.50

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McGraw-Hill Book Co., Inc., 330 West 42d St., New York, N. Y.
You may send me for 10 days' free examination, the six-volume Dingman BUILDING CONTRACTORS' LIBRARY. I agree either to return the books at the end of 10 days or send a first payment of $1.50 then and $2.00 a month for six months.

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Abundant Light

when and where you need it

For the big job

National Carbide V.G. Lights assure safety through adequate lighting on all construction, maintenance and repair jobs.

They are superior in:
CLEARNESS of ILLUMINATION
ECONOMY
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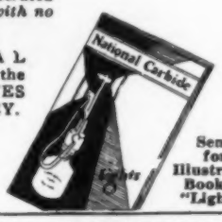
They can be operated intermittently with no waste.

NATIONAL CARBIDE in the Red Drum SAVES YOU MONEY.

Warehouses from coast to coast

For the small job



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NATIONAL CARBIDE SALES CORP.
LINCOLN BUILDING NEW YORK, N. Y.

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RAIN
WIND
SLEET
FOG
UPKEEP

Toledo Torch

The Toledo Pressed Steel Co.
TOLEDO OHIO

Save with Steel

Manufacturers of The Toledo Horse—the ideal highway barricade

EDITORIALLY, the January issue of Construction Methods will carry the story of *what* 1931 *has contributed toward changes in road-building practice.* Illustrated articles on the following subjects are planned:—

- Trends in concrete paving.
- Contractor increases production on 40-ft. highway.
- Eliminating delays in paving operation.
- Low-cost improved roads by use of bituminous surfacing.
- Management and operation of large fleet of trucks.
- Road grading with tractors.
- Special construction of highway intersection to reduce traffic delays.
- Brick road construction in Ohio.

SEARCHLIGHT SECTION

EMPLOYMENT : BUSINESS : OPPORTUNITIES : EQUIPMENT—USED or SPECIAL

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Box Numbers in care of any of our offices count 10 words additional in undisplayed ads.

Discount of 10% if one payment is made in advance for four consecutive insertions of undisplayed ads (not including proposals).

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1 inch $7.50
2 to 3 inches..... 7.25 an inch
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Other spaces and contract rates on request.

An advertising inch is measured vertically on one column, 3 columns—30 inches—to a page.

COPY FOR NEW ADVERTISEMENTS RECEIVED UNTIL 10 A. M. ON THE 2ND FOR THE ISSUE OUT THE 9TH OF THE MONTH. C.M.

ALPHABETICAL INDEX TO ADVERTISERS

This index is published as a convenience to the reader. Every care is taken to make it accurate, but *Construction Methods* assumes no responsibility for errors or omissions.

▼ ▼ ▼

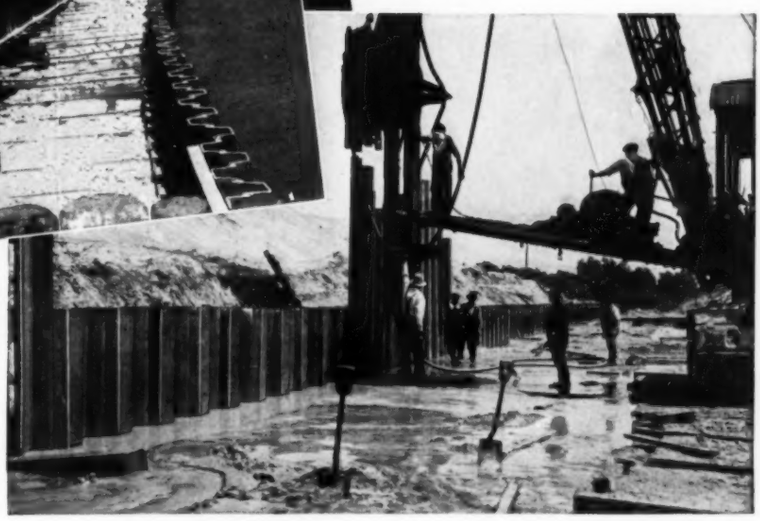
SEARCHLIGHT SECTION

Classified Advertising

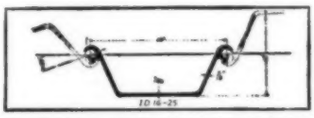
The Great Lakes Dredge & Dock Company, Chicago, used Inland Sheet Piling ID 16-25 on these projects.

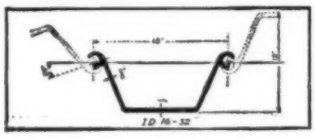
Left: Breakwater, Margate Ter. to Foster Ave., Lincoln Park, Chicago. Waling of Inland channels and bars, first all steel construction of this nature in an exposed location. At left, Mr. Hugh E. Young, Consulting Engineer for Lincoln Park Com. and Chief Engineer of Chicago Plan Com. discussing project with official of contracting company.

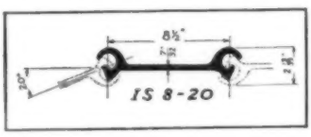
Below: Turning basin at East Chicago, Ind., built for Shell Petroleum Corporation.



CONTRACTOR ENTHUSIASTIC OVER INLAND PILING SERVICE







Section No.	Width	Lbs. per Sq. Ft. of Wall
ID 16-25	16"	25.00
ID 16-32	16"	32.00
IA 15-34	15"	34.00
IS 8-20	8½"	20.74

"OUR organization is enthusiastic about the splendid service rendered by Inland on Steel Sheet Piling," said an executive of the Great Lakes Dredge & Dock Company, one of the leading marine contractors of the country.

"Their deliveries were prompt, their detailed plans a great help to us in our work, and their product entirely satisfactory," he added.

This official also stated that the Lincoln Park breakwater was the first *all steel* project constructed in deep water at a location exposed to severe storms and wave action. (The Sheet Piling and the waling were entirely Inland Steel.) He declared that this type was preferred by his company, because of the economy and speed of construction and the stability of the installation.

Inland now produces the four sections of Steel Sheet Piling shown here; two or more additional sections will be added shortly to complete the Inland line.

We would welcome the privilege of conferring with you regarding your Sheet Piling problems and requirements. INLAND STEEL COMPANY, 38 South Dearborn Street, Chicago.

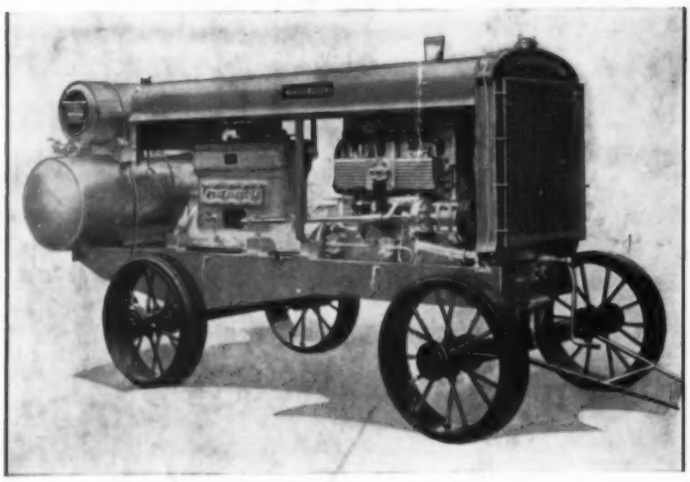
INLAND STEEL

ABLE SERVANT OF THE CENTRAL WEST

Sheets Bars Plates Structurals Piling

Rails Track Accessories Bands Rivets Billets

THE TEN GUARDSMEN
of the
AIR KING'S PERFORMANCE



HERE are ten vital points which guard the interests of the contractor. They are the ten features that make the Worthington Air King Portable Compressor an outstanding investment for contracting work.

- **The famous Feather Valve**
  Steel ribbons . . . new ones cost only 20 cents. The only compressor using these flexible, durable valves.
  This means economy.
- **Full force feed lubrication**
  Oil under 30 lb. pressure between all wearing surfaces. No "high bearings" to burn out as with splash system.
  This is protection.
- **Rated at higher speeds**
  Made possible by force feed lubrication, by balancing the flywheel and by counterbalancing the crankshaft.
  More reserve power.
- **Electrically welded frames**
  Extra heavy rolled steel. Blow holes, casting defects or shrinkage strains not possible as with cast steel frames.
  Strength and long life.
- **Flexible coupling**
  Insures against wear should the engine become misaligned.
  This is efficiency.
- **Automatic unloading system**
  Use of separate idling butterfly gives a snap pick-up to the engine before the compressor load comes on.
  This is advanced design.
- **Heavy duty Continental Engine**
  Replacable cylinder liners make reboring and oversize pistons unnecessary. Overhead valves give surplus power.
  Accessibility without dismantling.
- **Cooling water direct from radiator**
  Cooled water from bottom of the radiator is pumped to the compressor before being passed to the engine.
  This is common sense.
- **Low discharge air temperatures**
  Straight line air discharge. The Feather Valve is directly over the piston, not offset in compressor cylinder head.
  Aftercoolers unnecessary.
- **Vibrationless**
  The crankshafts and the flywheel are accurately balanced.
  This lowers maintenance.

COMPRESSORS *Portable and Stationary*	PUMPS *Centrifugal...Steam...Power Rotary...Deep Well*
ROCK DRILLING EQUIPMENT	FEEDWATER HEATERS
Rock Drills	CONDENSERS and Auxiliaries
Contractors Air Tools	METERS *Water...Grease Oil...Gasoline*
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